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THE EFFECT OF PHOSPHORUS IN RICKETS

I. ROENTGENOLOGIC CHANGES IN RICKETS FOLLOWING ADMINISTRATION OF PHOSPHORUS *

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The study of phosphorus and calcium metabolism is of vital interest to the clinician who desires to understand the physiology and the pathology of bone. In considering the value of elementary phosphorus in the prevention or in the control of rickets, one is reopening a discussion which is both interesting in its concept and intriguing in the contradictory evidence which the various groups of investigators of the past fifty years have found in their clinical and laboratory experiments.

During the early years of the match industry pathologists not infrequently encountered instances of phosphorus poisoning. Wegner [1] found that the bones of patients who died of chronic phosphorus poisoning were often hardened and enlarged, while the bones of those whose deaths were due to more acute phosphorus poisoning showed softening and necrosis. He undertook an experimental study of the effect of minute quantities of yellow phosphorus on the bones of growing dogs, cats and chickens. One four-hundredth grain of the elementary phosphorus was fed daily, and at necropsy in these animals the diaphyses showed excessive new bone which formed a dense layer in the ends of the shafts. The thickness of this dense zone varied with the length of the period during which phosphorus had been administered. A few infants with rickets were treated with phosphorus, but believing that rickets was a condition in which the power of depositing lime salts has been lost by the tissues, Wegner expressed doubt about the value of phosphorus in such cases. He also demonstrated that red phosphorus and phosphorus compounds, except calcium phosphate in large doses, produced no effects on growing bone.

Kassowitz [2] repeated and confirmed the experiments of Wegner on growing animals, and he extended his studies to include a large series of

* Submitted for publication, June 5, 1930.

* From the Department of Surgery, University of Chicago.

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1. Wegner, G.: Der Einfluss des Phosphors auf der Organismus, Virchows Arch. f. path. Anat. **55**:11, 1872; Ueber das normale und pathologische Wachsthum der Röhrenknochen, Virchows Arch. f. path. Anat. **61**:44, 1874.

2. Kassowitz, M.: Die Phosphorbehandlung der Rachitis, Ztschr. f. klin. Med. **7**:36, 1884.

clinical observations of the effect of phosphorus in the treatment of infants with rickets. He concluded that phosphorus in minute doses is "a specific remedy for rickets." Hess and Weinstock [3] and others have pointed out, however, that during the last three years of this series of studies, Kassowitz used a solution of phosphorus and cod liver oil, giving from 1 to 2 teaspoonfuls daily in proportions to make the daily dose of phosphorus 0.15 mg. Hess further criticized the conclusions of Kassowitz by noting that a large number of the cures were obtained during the summer months. An important contribution of Kassowitz was the demonstration that from two to four times the dose of phosphorus that produces osteosclerosis leads to osteoporosis and a picture essentially similar to that of experimental rickets.

Hochsinger [4] confirmed the clinical observations of Kassowitz, but Kissel,[5] following some experiments with phosphorus, concluded that it produced no general changes in the bones. Since he used ten times the dose employed by Wegner and by Kassowitz, his results are not comparable with theirs.

Miwa and Stoeltzner [6] also repeated the experiments and to some extent confirmed the results of Wegner. Schabad [7] maintained that phosphorus, when administered alone in the usual therapeutic doses, causes no increase in the accumulation of calcium in the body, and in some of the cases studied, even accelerated its elimination. He further contended that while cod liver oil alone causes a moderate increase, cod liver oil and phosphorus together cause a marked increase in the accumulation of calcium. He held that the cod liver oil and not the phosphorus is the primary active substance, and that the phosphorus merely augments the accumulation that is started by the oil.

Among the first in this country to advocate the use of phosphorus in the treatment for rickets was Jacobi,[8] who was even opposed to the

3. Hess, A. F., and Weinstock, Mildred: The Value of Elementary Phosphorus in Rickets, Am. J. Dis. Child. **32**:483 (Oct.) 1926.

4. Hochsinger, C.: Die Phosphorbehandlung der Rachitis im Jahre 1884, Jahrb. f. Kinderh. **23**:91, 1885.

5. Kissel, A.: Ueber die pathologisch-anatomischen Veränderungen in den Knochen wachsender Thiere unter dem Einfluss minimaler Phosphordosen, Virchows Arch. f. path. Anat. **144**:94, 1896.

6. Miwa, S., and Stoeltzner, W.: Hat die Phosphorbehandlung der Rachitis eine wissenschaftliche Begründung? Jahrb. f. Kinderh. **47**:153, 1898.

7. Schabad, J. A.: Der Phosphor in der Therapie der Rachitis, Ztschr. f. klin. Med. **67**:454, 1909; Die Behandlung der Rachitis mit Lebertran, Phosphor und Kalk, ibid. **68**:94, 1909; Phosphor, Lebertran und Sesamöl in der Therapie der Rachitis, ibid. **69**:435, 1910; Die gleichzeitige Verabreichung von Phosphorlebertran mit einem Kalksalze bei Rachitis, Jahrb. f. Kinderh. **72**:1, 1910.

8. Jacobi, A.: Therapeutics of Infancy and Childhood, Philadelphia, J. B. Lippincott Company, 1903, p. 131.

practice of combining the phosphorus with cod liver oil. Schloss [9] studied the problem with much the same approach as had Schabad, and he arrived at similar conclusions. Neither of these workers, however, offered any evidence obtained by studies of the calcium content of the bones at necropsy or by roentgenologic studies of the bones in the living. Engel [10] also agreed with Schabad that phosphorus alone is not a specific for rickets, but that it does aid in calcification when given in combination with cod liver oil.

The possibility of demonstrating the effect of yellow phosphorus on growing bones by means of the roentgen ray was shown by Phemister [11] in 1918. In 1921, Phemister, Miller and Bonar [12] published a roentgenologic study based on his observations in a short series of rachitic infants treated with cod liver oil and phosphorus or with phosphorus alone. Two infants with rickets treated with phosphorus alone were cured. As pointed out by others, diet and the summer season were factors that could not be excluded in bringing about the cures. Phemister and others suggested that the studies be continued and careful comparisons be made between the effects produced in rickets by phosphorus alone, cod liver oil alone and a combination of the two.

In 1925, Bernhardt and Rabl [13] studied the effect of phosphorus when added to a rat ration poor in calcium and phosphorus and concluded that it leads to "rachitoid" lesions. Since phosphorus (phosphorus pentoxide) was added to the ration in the ratio of 410 mg. to each 100 Gm. of food, each rat must have received an enormous amount of the drug, and "rachitoid" changes may have been due to overdosage.

Hess [14] and Hess and Weinstock,[3] using rats, studied the effect of white phosphorus added to known rickets-producing diets. Each animal received from 0.007 to 0.3 mg. of the elementary phosphorus daily. In most of the experiments, the daily dose was 0.2 mg. They concluded: "Elementary phosphorus, whether given in small or in large doses is unable to prevent the occurrence of rickets to any degree whatsoever."

9. Schloss, E.: Zur Therapie der Rachitis, Jahrb. f. Kinderh. **82**:435, 1915; **83**:46, 1916. Frank, L., and Schloss, E.: Zur Therapie der Rachitis, Monatschr. f. Kinderh. **13**:271, 1914.

10. Engel, K.: Pharmakologische Grundlagen der Phosphortherapie, Klin. Wchnschr. **3**:1771 (Sept. 23) 1924.

11. Phemister, D. B.: The Effect of Phosphorus on Growing, Normal and Diseased Bones, J. A. M. A. **70**:1737 (June 8) 1918.

12. Phemister, D. B.; Miller, E. M., and Bonar, B. E.: The Effect of Phosphorus in Rickets, J. A. M. A. **76**:850 (March 26) 1921.

13. Bernhardt, H., and Rabl, C. R. H.: Experimentelle Störungen des Mineralstoffwechsels und ihr Einfluss auf die Wirkung des weissen Phosphors, Ztschr. f. klin. Med. **102**:147, 1925.

14. Hess, A. F.: Irradiated Foods, Radium and Phosphorus, J. A. M. A. **85**:458 (Aug. 8) 1925.

Hess was able to offer evidence from these experiments that tended to confirm the belief which he had expressed a year previously, that "phosphorus is of no value in the prevention of rickets."

Stimulated by the clinical studies of Phemister and his associates and not convinced that the rat-feeding experiments of Hess and Weinstock showing that phosphorus did not prevent experimental rickets disproves its possible therapeutic value in rickets in infants, I undertook this study of the value of phosphorus either alone or in combination with other agents in the healing of this disease. Soon after beginning the work, my interest was heightened by the announcement of the Council on Pharmacy and Chemistry [15] of the American Medical Association that combinations of cod liver oil and phosphorus were no longer acceptable for New and Nonofficial Remedies. The council appeared to be influenced in this conclusion by the statement of Hess and Weinstock that phosphorus is a dangerous drug and of no value in the prevention or in the cure of rickets.

CONDITIONS, METHODS AND MATERIAL OF STUDY

Since Hess and Weinstock, and others, rightly criticized the results obtained by Phemister, Miller and Bonar by pointing out that treatment in the reported cases was carried out through the summer months, a season normally favorable to the healing of rickets, I selected the fall and winter months in which to begin my investigations. Hess and Unger,[16] Williams [17] and others have shown rather conclusively that the incidence of rickets increases during the fall and the winter, and that the peak of the curve is reached in February or March. Treatment in each case of the series reported here was begun during the period between the last part of September and the first part of March.

Throughout the experiments, the attempt was made to keep the environment, the hygienic conditions and the diet of the patients the same as those that characterized the period during which the rickets developed.

Through the cooperation of Dr. Heyworth Sanford, medical director, and Miss Sarah Place, superintendent, of the infant welfare work of the city of Chicago, I was fortunate in securing for my studies some of the most severe cases of rickets to be found in the city. These infants were studied at intervals of from three to six weeks. Roentgeno-

15. Council on Pharmacy and Chemistry: Combinations of Cod Liver Oil and Phosphorus Not Acceptable for New and Nonofficial Remedies, J. A. M. A. **91**:97 (July 14) 1928.

16. Hess, A. F., and Unger, L. J.: An Interpretation of the Seasonal Variation in Rickets, Am. J. Dis. Child. **22**:186 (Aug.) 1921.

17. Williams, C. T.: The Infrequency of Severe Rickets in New Orleans and Vicinity, Am. J. Dis. Child. **35**:590 (April) 1928.

grams were made of the knees, ankles and wrists, and determinations were made of the calcium, inorganic phosphate, carbon dioxide and hydrogen ion content of the blood serum. During the course of a year, twenty-nine cases of infantile rickets were observed in this study. Fourteen of the patients were not followed because the roentgenograms and the examinations of the blood showed that the rachitic condition was not so severe as that of the group that I wished to study. Five patients were lost through a change of residence to other cities or to other sections of this city where they could not be traced. In the series reported here there were ten patients with severe infantile rickets. One patient without rickets was included as a control. Some of the group received phosphorus alone; some received cod liver oil alone; some received phosphorus and cod liver oil from the beginning of treatment, and others were given cod liver oil or phosphorus after a period of medication during which the other substance had failed to promote healing. In order that there might be complete uniformity in the quality or grade of cod liver oil used, the product of a well known pharmaceutic house was supplied to the mother of each infant, and the dosage recommended by Eliot [18] in 1925 was prescribed.

In this report, I shall attempt to interpret the roentgenologic evidence only. In a second paper, the results of our studies of the chemical changes in the blood serum will be discussed. Since these patients presented the typical pictures of infantile rickets, their histories are not given in detail.

REPORT OF CASES

GROUP 1. MEDICATION: COD LIVER OIL ONLY (TABLE 1)

Case 1.—A. W., a Negro boy, aged 21 months, was first seen by me on Feb. 2, 1929. He had received cod liver oil irregularly since the age of 6 months. At the age of 9 months, he began to walk, but bowing of the legs soon developed, and was the most striking observation at the first examination in this clinic. Roentgenograms showed basket-shaped expansion of the juxta-epiphyseal portions and a frayed-out appearance of the ends of the shafts of the bones of the arm and leg (fig. 1). Cod liver oil was supplied to the mother and the child was given 2 drachms (7.5 cc.) twice daily. The parents cooperated well. Roentgenograms taken on March 27, thirty-seven days after the beginning of a consistent routine of cod liver oil therapy, showed marked improvement with a well defined line of ossification at the ends of the shafts. On April 26, the frayed-out condition of the ends of the shafts was no longer present, and there was marked increased ossification of the epiphyses. A final roentgen examination, on May 23, ninety-five days after beginning this treatment, showed complete disappearance of the rachitic process. The ends of the shafts were normal, and the shafts themselves were wider and the cortices thicker than in the first films. The centers of ossification of the epiphyses were distinctly shown in the roentgenograms. This infant gained 6 pounds (2.7 Kg.) in weight during the three months that he was under my observation in this study (table 1).

18. Eliot, M. M.: The Control of Rickets, J. A. M. A. **85**:656 (Aug. 29) 1925.

CASE 2.—J. G., a Mexican girl, 17 months of age, came under observation in this study on Oct. 31, 1928. There were the usual symptoms and evidences of severe rickets, with marked widening of the ends of the long bones and some bowing of the legs. The roentgenograms showed the shafts of the long bones to be markedly rarefied and disclosed the usual expansion and saucerized appearance of the juxta-epiphyseal portions and a frayed-out condition of the ends of the shafts. The mother was supplied with elementary phosphorus in the form

Fig. 1 (case 1).—A, before the beginning of treatment, moderately severe rickets with basket-shaped expansion of the ends of the shafts; *B*, sixty-seven days after the beginning of cod liver oil therapy, almost complete healing; *C*, ninety-five days after the beginning of treatment, not only is there complete healing of the rickets, but the shafts of the bones have increased in length and in thickness.

of one-hundredth grain (0.0006 Gm.) pills, with instructions to give one each morning and evening, burying the pill in a spoonful of cereal, so that the baby would not be aware of its presence. At the next visit on November 26, it was found that the mother had not been able to teach the baby to eat a cereal, and none of the pills had been used. I then prescribed 2 drachms (7.5 cc.) of cod liver

oil two times daily. By frequent visits to the home of this patient, it was learned that this medication was administered with a fair degree of consistency. Roentgen examination on Jan. 24, 1929, sixty-two days after the beginning of the cod liver oil therapy, showed some increase in the amount of ossification and less fraying of the ends of the shafts of the bones of the arm and leg. Roentgen examination on February 15 showed continued improvement; the centers of ossification in the epiphyses were clearly defined. The treatment was continued, and pictures taken on May 14 revealed almost complete healing. Final studies were made on July 22, and at this time there was excellent density of the shafts of the bones, the epiphyses and the juxta-epiphyseal portions (fig. 2).

TABLE 1.—*Effect in Rickets of the Administration of Cod Liver Oil Only*

Patient	Age, Mo.	Weight, Pounds	Race and Sex	Date	Medication	Days Receiving Medication	Roentgen Observations
Case 1 A. W.	21	24 (10.9 Kg.)	Negro male	2/18/29	Cod liver oil, 2 drachms twice daily	Begun	Marked rickets
	22	..	..	3/27/29	.....	37	Beginning healing; well defined ossification at end of shafts
	23	..	..	4/26/29	Cod liver oil, 2 drachms twice daily	67	Increased density of shafts and marked ossification of juxta-epiphyseal portion
	24	30 (13.6 Kg.)	..	5/23/29	Cod liver oil, 2 drachms twice daily	95	Complete healing
Case 2 J. G.	17	17.1 (7.75 Kg.)	Mexican female	10/31/28	By misunderstanding, no medication was begun at this visit	...	Severe rickets, shafts of long bones markedly rarefied, and ends of these bones frayed out and basket-shaped
	18	..	..	11/26/28	Cod liver oil, 2 drachms three times daily	Begun	No change noted in rachitic condition
	20	..	..	1/24/29	Cod liver oil, 2 drachms three times daily	62	Increased thickness of cortex of shafts and definite ossification at ends of shafts
	21	..	..	2/15/29	Cod liver oil, 2 drachms three times daily	85	Continued improvement; epiphyses themselves well defined
	24	..	..	5/14/29	Cod liver oil, 2 drachms three times daily	148	Healing almost complete
	26	36.5 (17 Kg.)	..	7/22/29	Cod liver oil, 2 drachms three times daily	196	Excellent density of shafts, epiphyses and juxta-epiphyseal regions of shafts; complete healing

GROUP 3. MEDICATION: PHOSPHORUS ONLY (TABLE 2)

CASE 3.—C. P., an Italian boy, aged 20 months, was first examined on Sept. 21, 1928; the examination revealed a palpable spleen, generalized adenopathy and fontanels that were widely open. He had had cod liver oil irregularly and two or three treatments with ultraviolet light (table 2). Roentgen examinations revealed no active rickets, but the bones were rarefied and the cortices were thin. Several transverse lines were noted near the ends of the tibiae, fibulae and bones of the arm, and these were thought to be due to some earlier process which temporarily checked longitudinal growth. Since this child had no active rickets, he was kept as a control case and was given two one-hundredth grain pills of ele-

mentary phosphorus daily. Roentgenograms taken on October 18 showed faint but definite, dense lines of increased density at the distal ends of the shafts of the second to fifth metatarsal bones, such as Phemister had noted in the case of normal infants to whom elementary phosphorus was given. On November 8, the "P" line was slightly wider and more dense. Subsequent examinations on Nov. 30, 1928, and Jan. 19, 1929, showed a gradually widening zone of increased

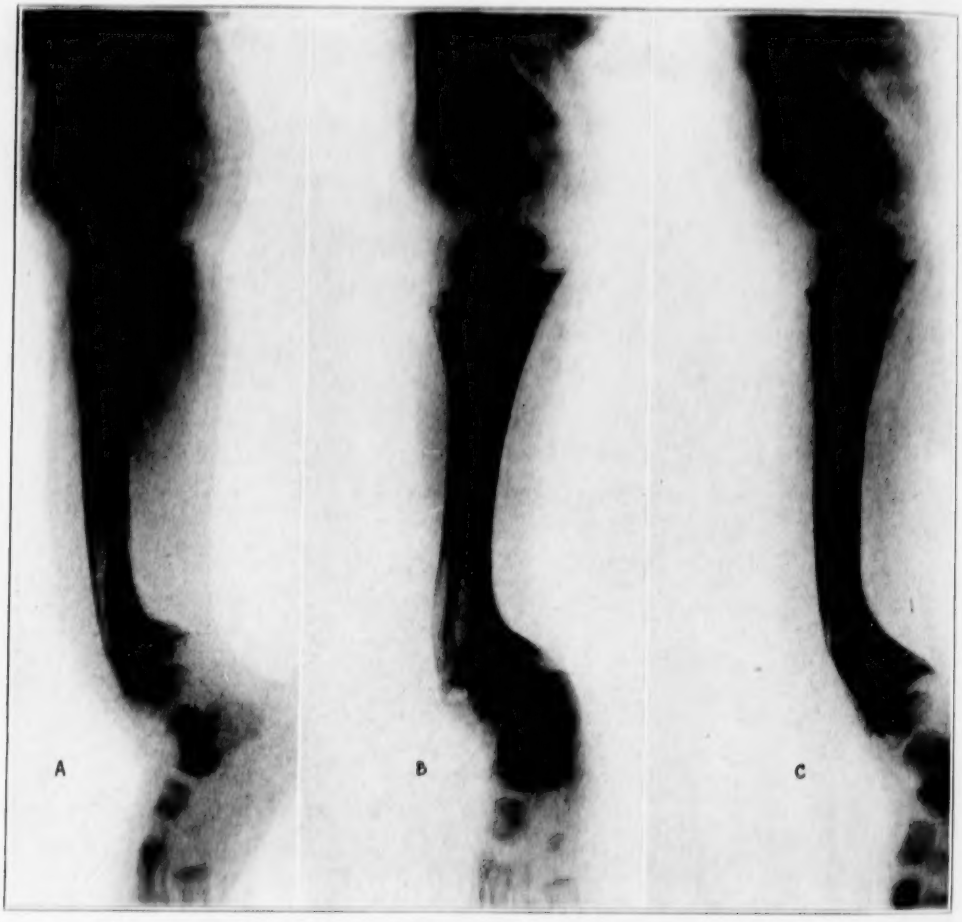

Fig. 2 (case 2).—*A*, before treatment, rickets in lower extremity; *B*, eighty-five days after the beginning of treatment with cod liver oil, some increase in density of the shafts of the bones is seen with evidence of healing in the juxta-epiphyseal portion of the shafts; *C*, complete healing after one hundred and eighty-three days of treatment with cod liver oil.

density at the end of each of the bones of the leg and arm (fig. 3). The medication with phosphorus was discontinued on Jan. 19, 1929. Roentgenograms taken on March 13, fifty-three days later, showed that the zone of dense bone at the ends of the long bones had continued to grow and was about twice as wide as when the treatment with phosphorus was discontinued.

TABLE 2.—*Effect in Rickets of the Administration of Phosphorus Only*

Patient	Age, Mo.	Weight, Pounds	Race and Sex	Date	Medication	Days Receiving Medication	Roentgen Observations
Case 3 C. P. control	20	20½ (9.2 Kg.)	Italian male	9/21/28	Phosphorus, 1/100 grain twice daily	Begun 9/20/28	No active rickets, but poor ossification of long bones with thin cortices and wide medullary cavities; two or more transverse lines noted near growing ends of shafts, suggesting an earlier process, possibly rickets, which temporarily checked longitudinal growth; fontanels widely open
	21	23 (10.4 Kg.)	..	10/18/28	Phosphorus, 1/100 grain twice daily	29	Faint but definite single, dense lines of increased density at distal ends of shafts of second to fifth metatarsal bones
	21½	..	..	11/ 8/28	Phosphorus, 1/100 grain twice daily	41	"P" line slightly wider and more dense
	22	..	..	11/30/28	Phosphorus, 1/100 grain twice daily	63	Increased density of cortices and a definite line of dense ossification at growing end of all long bones
	24	..	..	1/10/29	Phosphorus discontinued	82	A widening of zone of increased density
	26	28 (12.7 Kg.)	..	3/13/29	.....	53 days after stopping phosphorus	Continued growth of zone of increased density, so that it is now about twice as wide as when phosphorus was discontinued
Case 4 A. M.	16	17½ (7.93 Kg.)	Mexican male	9/21/28	Phosphorus, 1/100 grain twice daily	Begun 9/20/28	Usual picture of severe rickets; transverse lines of increased density near epiphyseal line, suggesting temporary check of rachitic process, possibly during summer
	17	..	..	10/18/28	Phosphorus, 1/100 grain twice daily	21	Suggestion of slight increase of ossification in juxta-epiphyseal region of shaft
	17½	..	..	11/ 8/28	Phosphorus, 1/100 grain twice daily	42	Increased density of shafts of long bones; "P" line at growing ends of shaft
	18½	..	..	12/ 6/28	Phosphorus, 1/100 grain twice daily	70	Almost complete healing; dense zone of calcification at ends of long bones
Case 5 E. M.	25	18 (8.2 Kg.)	Mexican female	9/21/28	Phosphorus, 1/100 grain twice daily	Begun 9/27/28	Floridly active rickets; all bones exceedingly osteoporotic; marked deformity of lower ends of tibiae
	26	..	..	10/18/28	Phosphorus, 1/100 grain twice daily	21	No change noted in roentgenographic appearance
	26½	..	..	11/ 8/28	Phosphorus, 1/100 grain twice daily	42	Slight increase in density of shafts of long bones
	27½	..	..	11/30/28	Phosphorus, 1/100 grain twice daily	64	Slight increase in density of shafts and beginning ossification in frayed ends of long bones, but rachitic process is not definitely checked

CASE 4.—A. M., a Mexican boy, aged 16 months, presented the typical picture of severe rickets when first examined on Sept. 21, 1928. Examination by means of the x-rays revealed poor ossification of the bones and expansion of the ends of the bones with cupping and fraying (fig. 4). Irregular zones of increased density near the epiphyseal line suggested a temporary check of the rachitic process, possibly during the summer months. Two one-hundredth grain pills of phosphorus to be given daily were prescribed on September 28. Roentgen examinations on October 18 and November 8 revealed increased density of the shafts of the bones and a definite increase in the amount of ossification in the juxta-

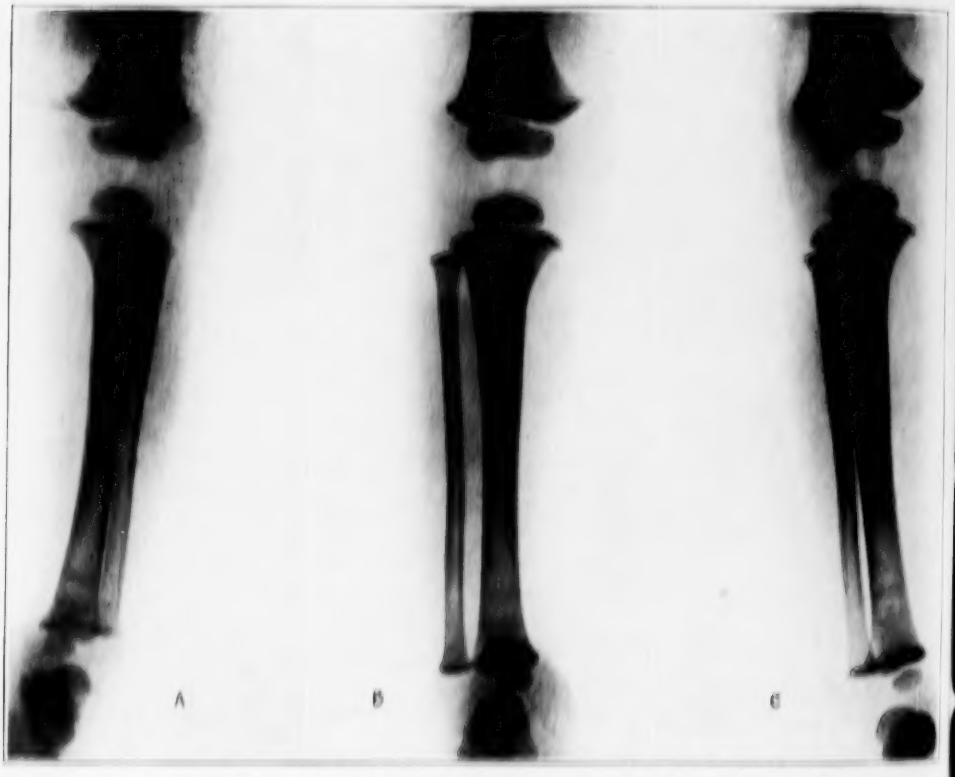

Fig. 3 (case 3).—A, no active rickets but poor ossification of the bones; note the transverse lines near the ends of the shafts of the bones; *B*, after eighty-two days of phosphorus therapy there is a heavy, broad shadow in the end of the shaft of each bone; *C*, fifty-three days after discontinuance of the treatment with phosphorus, the zone of increased density has continued to grow.

epiphyseal portion of the shafts. On December 6, seventy days after the beginning of the phosphorus therapy, roentgenograms showed marked improvement, with a dense zone of calcification at the ends of the long bones. This family moved without leaving an address and could not be located again.

CASE 5.—E. M., a Mexican girl, aged 28 months, with the usual signs of severe rickets, including marked bowing of the legs just above the malleoli and inability

to stand, was seen on Oct. 21, 1928. The x-ray pictures showed extremely severe rickets. All of the bones were exceedingly rarefied, with little ossification in the juxta-epiphyseal portion of the shafts of the long bones (fig. 5). This patient was also given phosphorus in the form of one-hundredth grain pills twice daily. The roentgen examinations on October 18 showed slight increase in the density of the shafts of the bones, but no definite evidence of healing of the rickets. On November 30, there was slight increase in ossification in the juxta-epiphyseal

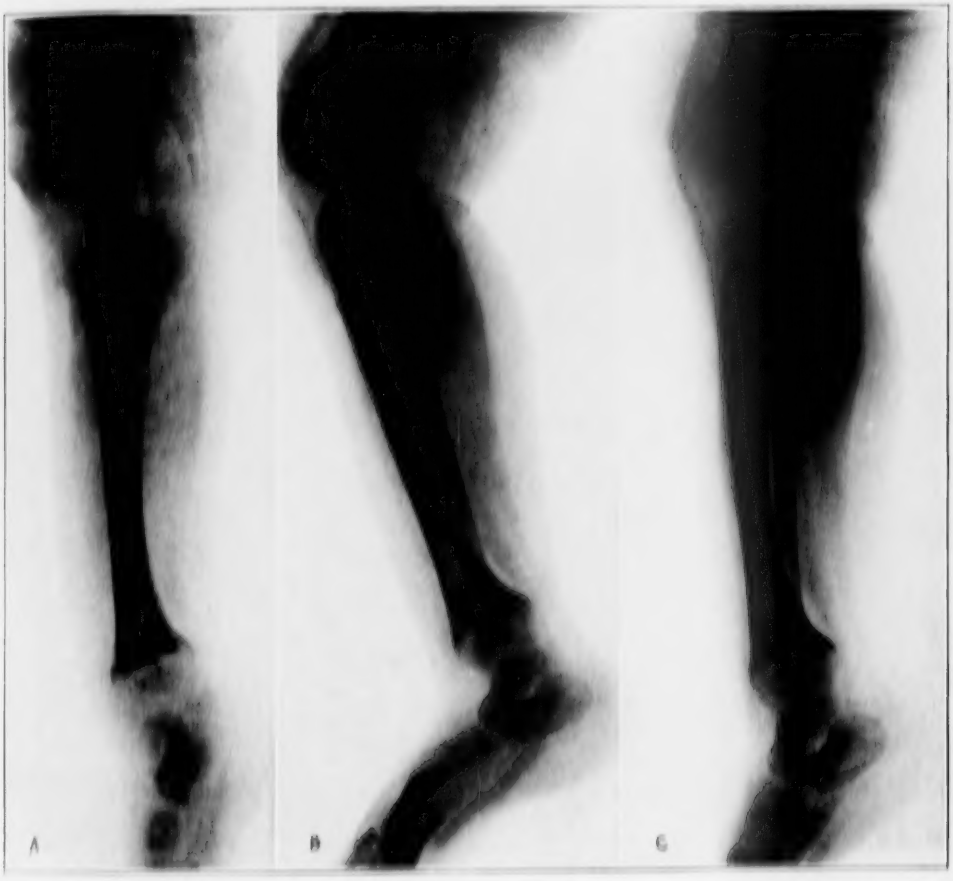

Fig. 4 (case 4).—*A*, before treatment, severe rickets; *B*, rather marked improvement noted after forty-two days of treatment with phosphorus; *C*, after seventy days of treatment with phosphorus, the shafts of the bones have become wider and denser, and the juxta-epiphyseal portion of the shafts is normal in density; the ends of the shafts themselves, however, are still cupped or basket-shaped.

region of the long bones, but one could not be sure that the progress of the rickets had been checked. Through an unfortunate circumstance I was not permitted to study this baby any more.

GROUP 3. MEDICATION: PHOSPHORUS; COD LIVER OIL ADDED LATER (TABLE 3)

CASE 6.—F. T., a Mexican girl, aged 2 years, was examined at one of the city welfare stations on Oct. 29, 1928. She had the appearance of having long-standing, severe rickets. X-ray pictures were made of the extremities, and these revealed the usual expansion, fraying and basket-shaped appearance of the ends of the long bones, with some irregular areas of increased density that suggested beginning healing. Two one-hundredth grain pills of elementary phosphorus to be taken

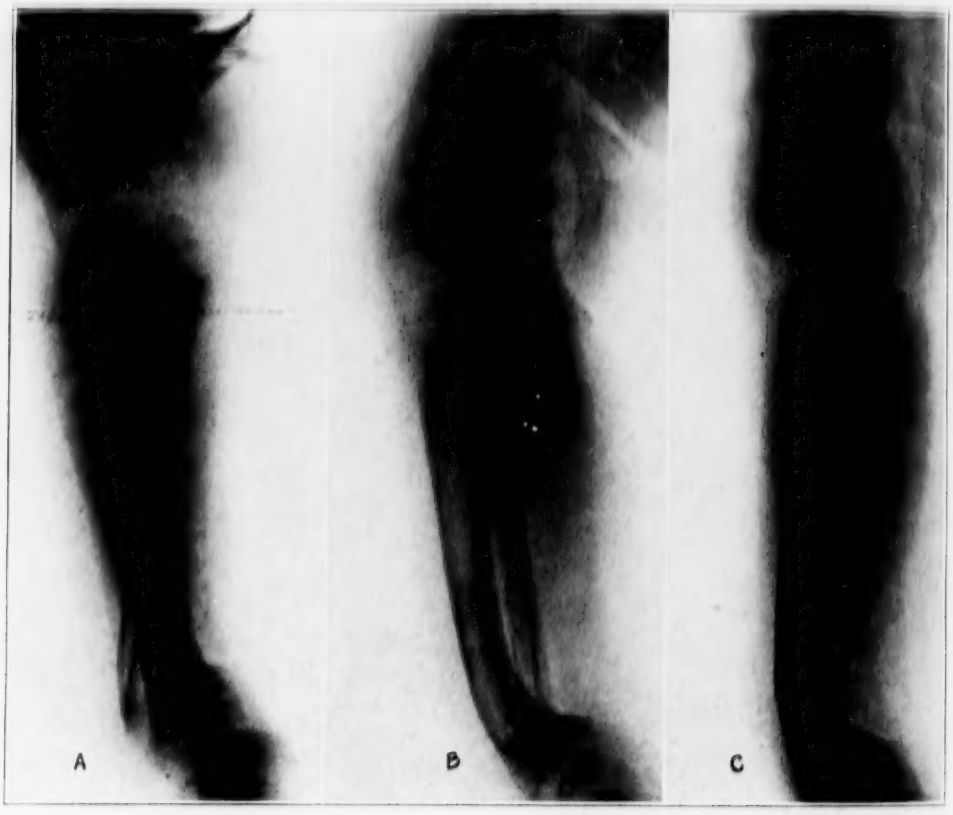

Fig. 5 (case 5).—*A*, before treatment, extremely severe rickets; *B*, improvement noted after forty-two days of treatment with phosphorus; there is increased density of the shafts, and the fraying at the ends of the bones is much less marked; *C*, after sixty-four days of treatment with phosphorus, the bones are thicker, and the rickets, while not entirely cured, is definitely less severe than at the time that treatment was begun.

twice daily were prescribed. Roentgenograms made on Dec. 18, 1928, Jan. 24, 1929, and February 15, the last date 103 days after the beginning of the administration of phosphorus, showed little improvement. The shafts of the long bones were slightly increased in thickness, and the fraying at the ends of the long bones was slightly less marked, but circumscribed areas of decreased

TABLE 3.—*Effect in Rickets of the Administration of Phosphorus with Cod Liver Oil Added Later*

Patient	Age, Mo.	Weight, Pounds	Race and Sex	Date	Medication	Days Receiving Medication	Roentgen Observations
Case 6 F. T.	24	18 (8.2 Kg.)	Mexican female	10/29/28	Phosphorus, 1/100 grain twice daily	Begun 11/ 4/28	Marked rickets; ends of long bones widened, frayed and basket-shaped, but apparently beginning to ossify
				12/18/28	Phosphorus, 1/100 grain twice daily	44	Ossification of ends of long bones more definite; fraying less marked; circumscribed areas of decreased density in distal end of tibia more marked
				1/24/29	Phosphorus, 1/100 grain twice daily	81	Shafts of long bones slightly increased in thickness
				3/15/29	Phosphorus, 1/100 grain twice daily	103	Appearance about the same as at last examination
				4/ 3/29	Phosphorus, 1/100 grain twice daily, continued, and cod liver oil, 2 drachms twice daily, begun	149	Ossification even less than that of six weeks ago; shafts of long bones markedly decalcified
				5/14/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily	191	Increase in density of shafts of long bones
				6/12/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily	220	Marked improvement
				7/ 1/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily	241	Rachitic process almost healed
	33	29 (13.2 Kg.)	"	7/22/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily	263	Complete healing
Case 7 A. B.	23	19 (8.6 Kg.)	Negro female	11/ 1/28	Phosphorus, 1/100 grain twice daily	Begun 11/2/28	Extremely severe rickets; all of bones markedly rarefied
				11/23/28	Phosphorus, 1/100 grain twice daily	21	No notable change in appearance of bones
				1/12/29	Phosphorus, 1/100 grain twice daily	56	No notable change in density of bones (phosphorus has not been taken consistently)
				2/26/29	Phosphorus, 1/100 grain twice daily	101	No notable change
				3/12/29	Cod liver oil, 2 drachms twice daily begun	115	Apparent slight increase in density of shafts of long bones
				5/14/29	Cod liver oil, 2 drachms twice daily	177	Some improvement in ossification in juxta-epiphyseal region
				7/ 8/29	Cod liver oil, 2 drachms twice daily	231	Improvement definite, though medication has been slightly irregular
				7/29/29	Cod liver oil, 2 drachms twice daily	252	Almost complete healing

density in the distal ends of the tibiae were more marked and resembled bone cysts (fig. 6). On April 2, 149 days after the beginning of the phosphorus therapy, the bones appeared to be even more rarefied than at the previous examinations, and 2 drachms of cod liver oil twice daily were prescribed in addition to the elementary phosphorus. Roentgenograms taken on May 14, 42 days after the addition of the cod liver oil therapy, showed increased density of the shafts of the bones and beginning healing in the juxta-epiphyseal portion. Examinations on June 12 and July 1 revealed continued and rapid healing. On July 22, a roentgen examination showed well calcified ends of the bones of the extremities

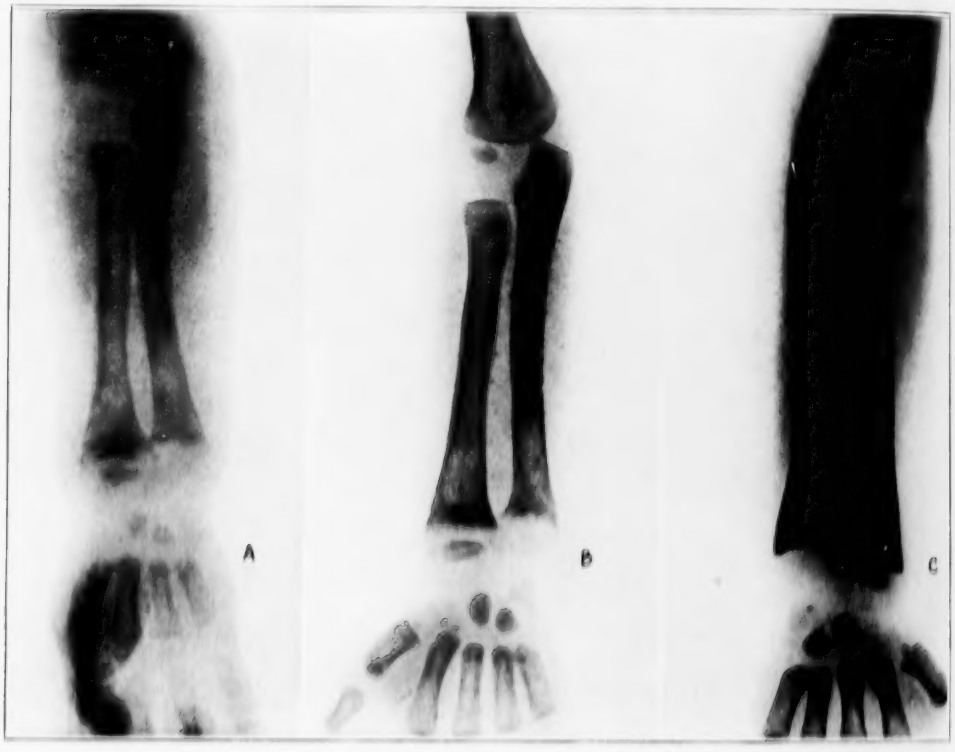

Fig. 6 (case 6).—*A*, before treatment, severe rickets of the forearm; *B*, after one hundred and forty-nine days of phosphorus therapy, there is little evidence of healing of the rickets, although the shafts of the bones are wider and more dense than at the first examination; *C*, one hundred and fourteen days after the addition of cod liver oil to the phosphorus, there is complete healing and the density of all of the bones is unusually good.

and normal density of the centers of ossification of the epiphyses and of the shafts of the bones.

CASE 7.—A. B., a Negro girl, aged 23 months, was first seen on Nov. 1, 1928, with the picture of extremely severe rickets. All of the bones of the extremities were found to be markedly rarefied, and there was the usual basket-shaped expansion of the ends of the long bones, with fraying in the juxta-epiphyseal portion.

One-hundredth grain phosphorus pills, one twice daily, were prescribed. The mother did not cooperate well, but the child received at least one pill and usually two as directed. Roentgen examinations were made on Nov. 23, 1928, Jan. 12, 1929, February 26 and March 12, the last date being 115 days after the prescribing of phosphorus. These pictures showed no definite change in the appearance of the bones of the extremities, although in the last pictures taken there may have been some increase in the density of the shafts of the long bones (fig. 7). The bowing of the legs had become much more marked. Two drachms of cod liver oil to be taken twice daily were prescribed in addition to the phosphorus pills. On May 14, some increased calcification in the juxta-epiphyseal portion was noted. The

Fig. 7 (case 7).—*A*, forearm showing severe rickets before treatment; *B*, little change is noted after one hundred and fifteen days of treatment with phosphorus; *C*, one hundred and thirty-seven days after cod liver oil was added to the phosphorus therapy, although neither substance was administered regularly, definite healing is noted, especially at the ends of the shafts of the bones of the elbow.

medication was not given as consistently as had been directed, but pictures taken on July 8 showed a definite increase in the density of all of the bones and healing of the ends of the shafts. Although the cooperation of the mother continued to be unsatisfactory, treatment with both medicines was kept up, and roentgenograms taken on July 29 showed almost complete healing of the rachitic process, though with rather marked deformity due to the curvature of the tibiae and fibulae.

GROUP 4. MEDICATION: PHOSPHORUS AND COD LIVER OIL (TABLE 4)

CASE 8.—C. T., a Negro girl, aged 20 months, was seen on March 22, 1929, with definite clinical symptoms and evidences of rickets. This patient had been receiving cod liver oil rather consistently for about sixty days prior to the examination, and the roentgen rays at this time revealed evidence of healing of what had been a case of severe rickets. The frayed appearance of the distal ends of the femurs was the most marked sign of the activity of the rachitic process.

Fig. 8 (case 8).—*A*, healing rickets; patient had had cod liver oil daily for two months before admission; the expansion of the ends of the shafts and the irregular ossification at the lower end of the femur and the upper end of the fibula are to be noted; *B*, after seventy-six days of additional cod liver oil treatment, the condition of the lower end of the femur is not changed; *C*, complete healing is seen with excellent density of all of the bones, after fifty-eight days of combined phosphorus and cod liver oil treatment.

Treatment with cod liver oil, 2 drachms three times daily, was continued, but on June 6, seventy-six days later, little additional improvement could be noted from the roentgenograms. One-hundredth grain phosphorus pills, one twice

TABLE 4.—*Effect in Rickets of the Administration of Phosphorus and Cod Liver Oil*

Patient	Age, Mo.	Weight, Pounds	Race and Sex	Date	Medication	Days Receiving Medication	Roentgen Observations
Case 8 C. T.	20	..	Negro female	3/22/29	Patient has had 2 drachms of cod liver oil twice daily for two months	Approximately 60	Apparently healing rickets, but distal ends of femurs still frayed
				6/ 6/29	Phosphorus, 1/100 grain twice daily added	136	Condition essentially unchanged
	24½	..	..	8/ 3/29	.....	194	Excellent density of shafts of bones; complete healing of ends of shafts
Case 9 H. S.	14	20 (9 Kg.)	Negro male	1/19/29	Patient has had cod liver oil sporadically for several months; given cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	Begun	Marked spreading of ends of long bones with fraying and osteoporosis of juxta-epiphyseal portion and of shafts themselves
				2/ 4/29	Cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	16	Essentially the same appearance
				2/25/29	Cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	37	Definite healing and increased density of shafts; narrow "P" line at ends of metatarsal bones
				3/26/29	Cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	60	Healing process more definite
				4/23/29	Cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	86	Healing almost complete
	40	..	..	5/30/29	Cod liver oil, 2 drachms, and phosphorus, 1/100 grain twice daily	135	Complete healing of juxta-epiphyseal portion and marked density of shafts themselves and of epiphyses; definite "P" lines
Case 10 R. C.	28	..	Mexican female	2/ 5/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily (has had cod liver oil occasionally)	Begun	Ends of shafts of long bones frayed and thickened; moderately severe rickets
				4/ 1/29	Phosphorus, 1/100 grain, and cod liver oil, 2 drachms twice daily	44	Definite healing

TABLE 4.—*Effect in Rickets of the Administration of Phosphorus and Cod Liver Oil—Continued*

Patient	Age, Mo.	Weight, Pounds	Race and Sex	Date	Medication	Days Receiving Medication	Roentgen Observations
				5/14/29	Medication has not been given consistently	83	Markedly increased density of shafts of long bones and of epiphyses; slight irregularity of distal end of femur
	32½	..	..	7/ 2/29	Medication has not been given consistently	132	Complete healing; marked density of all bones
Case 11 J. M., premature infant weighing 2 lbs. 9 oz. (1.18 Kg.) at birth. Has had ½ drachm of cod liver oil daily since 8 weeks of age	6	11 (5 Kg.)	Negro female	11/18/29	Cod liver oil, 1 drachm, and phosphorus, 1/100 grain twice daily	Begun	The most severe case of active rickets of our series; extreme osteoporosis of all bones; apparent fraying of cortices; widened, basket-shaped ends of long bones; marked involvement of upper ends of femurs; no demonstrable ossification of epiphyses of ulna and radius; marked shortening of shaft of right radius
				12/ 9/29	Cod liver oil, 1 drachm, and phosphorus, 1/100 grain twice daily	21	Slight increase in density of shafts and in juxta-epiphyseal portion of long bones
	8½	15 (6.8 Kg.)	..	2/ 5/30	Cod liver oil, 1 drachm, and phosphorus, 1/100 grain twice daily	78	Arrest of rachitic process; definite increase in length and in width as well as in density of shafts of long bones; epiphyses distinctly outlined

daily, in addition to cod liver oil, 2 drachms twice daily, were prescribed. On August 3, two months after the addition of the phosphorus to the daily therapy, roentgenograms showed excellent density of the shafts of the bones and complete healing of the juxta-epiphyseal portions (fig. 8).

CASE 9.—H. S., a Negro boy, aged 14 months, came to the University of Chicago Clinics on Jan. 19, 1929. Although, according to the mother, the child had been given from 2 to 6 teaspoonfuls of cod liver oil daily since he was 2 or 3 months old, he was not yet able to support his weight well enough to walk, and the physical observations were typical of those in active and well advanced cases of untreated rickets. Roentgenograms at the time of this first visit showed marked spreading of the ends of the long bones, with fraying and osteoporosis of the juxta-epiphyseal portion and rarefaction of the shafts. The cod liver oil therapy was continued, with the admonition that the child should receive 2 drachms twice daily and in addition 2 one-hundredth grain pills of phosphorus twice daily. On February 4, sixteen days after the beginning of the combination therapy, the roentgenograms revealed essentially the same appearance of the bones as that of January 19. But definite healing and increased density of the shafts of the bones, with a narrow "P" line at the ends of the metatarsal bones, were the principal observations on February 25. Roentgenograms taken on March 26 and April 22 revealed continued improvement, and the pictures taken on May 20 showed the rickets to be completely healed, with marked density of the shafts, of the juxta-epiphyseal portion and of the epiphyses themselves. The "P" lines previously noted were wider and more dense (fig. 9).

CASE 10.—R. C., aged 28 months, a Mexican girl, with moderately severe rickets, was first seen on Feb. 15, 1929. She had had an occasional dose of cod liver oil during the past year, but never with any degree of regularity. The x-ray pictures showed the ends of the shafts of the long bones frayed and expanded, with little cupping. On April 1, 44 days after the combination therapy

Fig. 9 (case 9).—*A*, the rather marked rickets that persisted after several months of irregular medication with cod liver oil; *B*, marked improvement after sixty days of treatment with cod liver oil and phosphorus; note the "P" lines at the distal ends of the second to fifth metatarsal bones; *C*, complete healing of the rickets with marked density of all of the bones after one hundred and twenty-five days of the combined cod liver oil and phosphorus therapy.

of cod liver oil, 2 drachms, and phosphorus, one one-hundredth grain, twice daily, was started, increased density of the shafts and healing in the juxta-epiphyseal portions were noted. Although the mother, as she confessed, had not been con-

sistent in giving the medication, roentgenograms taken on May 14 showed complete healing, with the exception of slight irregularity of the distal ends of the femurs. On July 2, 132 days after the beginning of the medication, the rachitic process was entirely healed, and there was rather marked density of all of the bones examined by means of the x-rays (fig. 10).

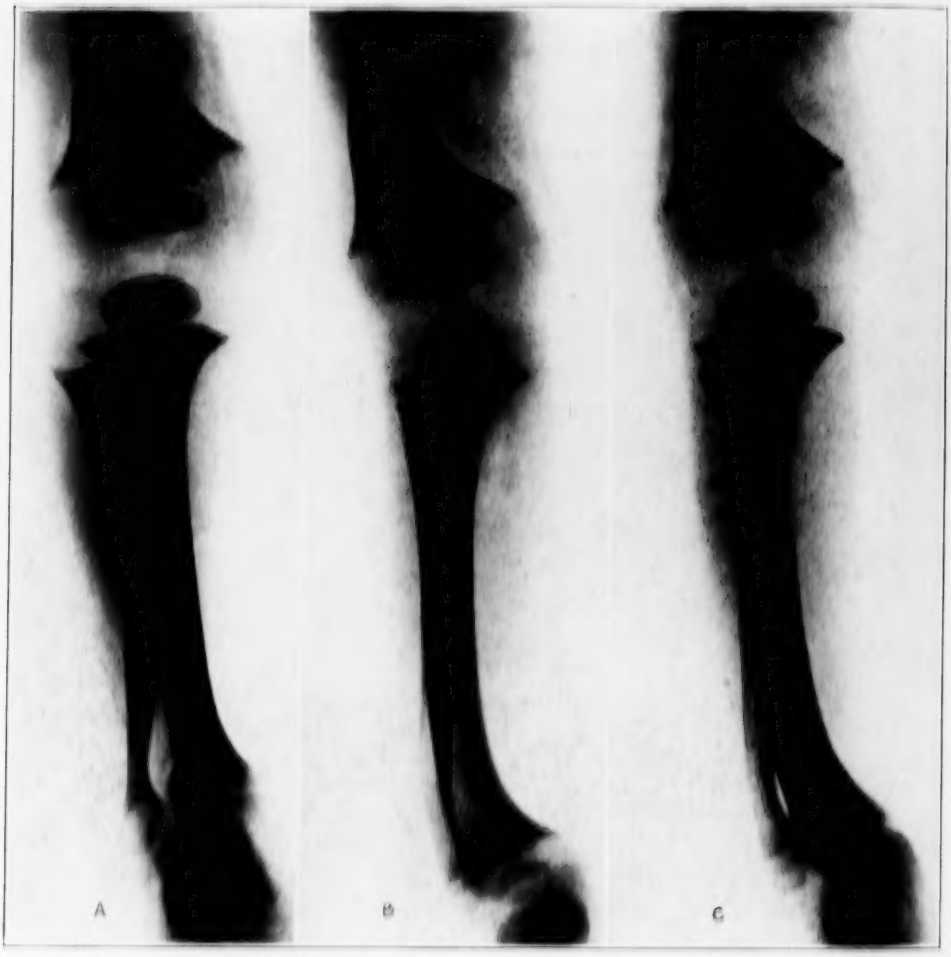

Fig. 10 (case 10).—*A*, moderately severe rickets before treatment in an infant aged 28 months; *B*, marked improvement after eighty-three days of treatment with cod liver oil and phosphorus; *C*, complete healing with excellent density of all of the bones one hundred and thirty-two days after the beginning of the combination therapy.

Case 11.—J. M., a Negro girl, aged 6 months, was brought to the University Clinics on Nov. 18, 1929. This patient, a premature infant weighing 2 pounds and 9 ounces (1.18 Kg.) at birth, had the most severe case of active rickets of the series. Although the child had received at least one-half teaspoonful of cod

liver oil daily since it was 8 weeks old, the roentgenograms taken on the date of admission revealed extreme osteoporosis of all of the bones. The cortices, as well as the ends of the long bones, were indistinct and frayed in appearance. There was marked basket-like expansion of the ends of the long bones with marked shortening of the shaft of the right radius (left not roentgenographed). This patient was given 1 drachm of cod liver oil and one one-hundredth grain of phosphorus twice daily. On December 9, definite increase in density of the bones was noted. On Feb. 5, 1930, roentgen examination showed the rachitic process entirely healed (fig. 11). There was definite increase in length, as well as in width, and increase in density of the shafts of the long bones of the extremities. The ends of the long bones were normal or greater than normal in density,

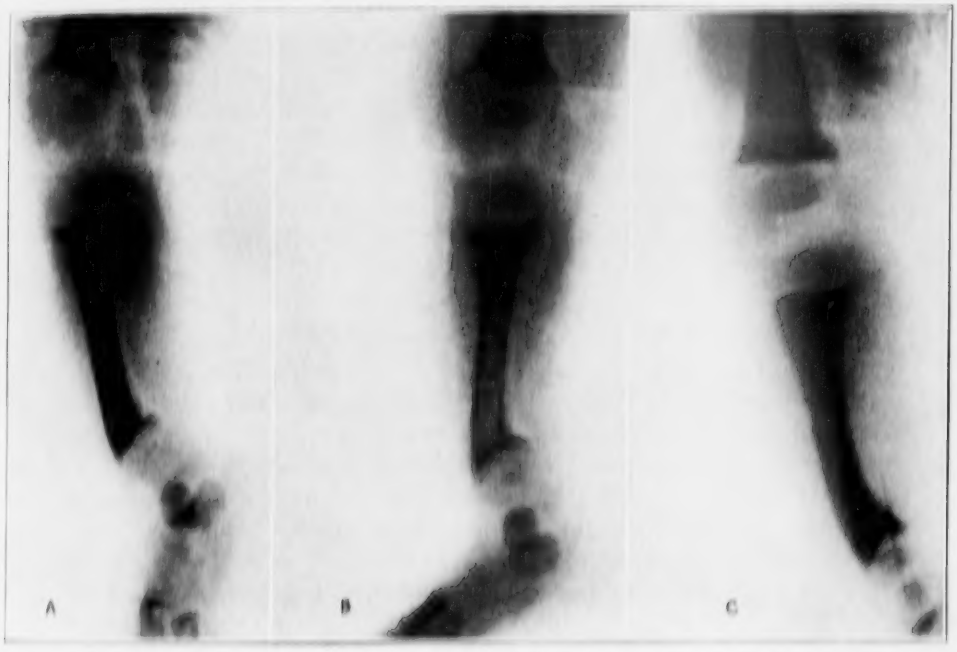

Fig. 11 (case 11).—*A*, extremely severe rickets in a 6 months old premature infant; this condition developed in spite of cod liver oil therapy; *B*, some improvement is noted twenty-one days after the beginning of treatment with cod liver oil and phosphorus; *C*, complete healing following seventy-eight days of combination phosphorus and cod liver oil therapy.

and the centers of ossification in the epiphyses were distinctly outlined. This rather remarkable example of healing in a case of extremely severe rickets in a premature infant in whom the disease had developed in spite of cod liver oil therapy was accomplished in the brief period of seventy-eight days. The combination of cod liver oil and phosphorus therapy was begun in November, the month in which rickets is ordinarily becoming more severe, and healing was complete in February, the month in which the incidence of rickets is ordinarily found to be the highest.

REVIEW OF RESULTS

In visits to the various welfare clinics in the city I observed all of the varying degrees of rickets. I selected for particular study only the most severe cases that were found in a total group of approximately 1,500 infants under 2 years of age, most of whom were Negroes or Mexicans, whose lack of resistance to rickets is well known. In no instance was treatment begun during the late spring or during the summer months. In most instances, observations were begun in the fall or in the winter months. No attempt was made to alter the home conditions; during the entire period of treatment, diet and home hygiene remained essentially the same as they had been during the period of development of the rickets. Moderate doses of cod liver oil, varying from 2 to 6 drachms daily and known to be curative for a high percentage of cases of rickets, were used. The dose of elementary phosphorus, whether given alone or in combination with cod liver oil, was arbitararily selected as one one-hundredth grain twice daily. This amount is known to stimulate juxta-epiphyseal osteogenesis in normal bones of young children. The results may be reviewed according to groups.

The two babies in group 1 received cod liver oil only (table 1). Both were less than 2 years of age. One was a Mexican and the other a Negro, and both had marked rickets, although the roentgenographic changes in the bones of the Mexican child were more marked than those in the bones of the Negro infant. In one case, treatment was begun during the middle of February, the month in which the incidence of rickets has been found to be highest [19] in this section of the country. Treatment in the other case was begun in November, a month in which the incidence and severity of rickets are on the increase. Both infants responded slowly to treatment, but by late spring they were discharged as cured. I was able to follow up these patients and to assure myself that they were receiving the medication as prescribed. The improvement in the calcium and phosphorus content of the blood in these two cases and in the subsequent cases paralleled the roentgenographic observations. A discussion of these determinations of the blood chemistry will be included in the second paper.

The cases in group 2 show the effect of phosphorus alone (table 2). Case 3 was used as a control. After eighty-two days of phosphorus therapy there were bands of increased density at the ends of the shafts of the long bones and in the juxta-epiphyseal region, and the shafts themselves had greatly increased in density. This so-called "P" band continued to increase in width after the treatment with phosphorus was discontinued. Irregular calcification in the frayed-out juxta-epiphyseal

19. Hess and Unger (footnote 16). Williams (footnote 17).

regions of the bones in case 4 at the time of the first observation of the patient suggested beginning healing of very severe rickets. Improvement was noted after seventy days of treatment with phosphorus. From later results I am inclined to attribute this apparent healing to the possible coincidence of beginning the phosphorus therapy at a time when the healing process had already been stimulated by the ultraviolet rays of the summer sunshine. Little, if any, improvement could be noted from the administration of phosphorus over a period of sixty-four days in the last case in this group. From a clinical point of view, this infant was worse at the end of the period of observation than when first observed.

Two cases of extremely severe rickets comprise group 3 (table 3). Phosphorus therapy was instituted in each case and was continued for 149 and 115 days, respectively. No improvement in the rachitic condition could be determined either roentgenologically or from the standpoint of the increase in serum calcium or serum phosphorus. After the addition of cod liver oil to the phosphorus therapy, the healing response was slow but definite, and complete healing of the rachitic process was demonstrated by late spring. The slow response to the administration of cod liver oil in these cases of severe rickets in which the ability to deposit lime salts has been entirely lost may be due to a condition similar to that of phosphorus poisoning, which in turn has to be overcome before the healing of the rickets may be brought about.

Group 4 includes four cases in which a combination of cod liver oil and phosphorus was used (table 4). There were three Negroes and one Mexican in this series. The ages varied from 6 to 28 months. Except in case 8, the rickets in each instance was severe. In cases 8 and 9 cod liver oil had been given rather consistently for several months before the infants were brought to the clinic, and in the former case beginning healing was shown, but in case 9 roentgenograms revealed severe and active rickets with no evidence of healing. Case 11 was that of a premature infant who had received a small amount of cod liver oil daily since she was 2 months old, but who showed all of the signs of exceedingly severe rickets. These babies were given the usual combination of cod liver oil and phosphorus. Treatment in each case was begun in the fall or in the winter months, and improvement was noted in each case within from two to six weeks. The shortest period between the beginning of the combination therapy and complete healing was 58 days, and the longest was 132 days. Since almost all clinicians have great difficulty in preventing rickets in premature infants, especially in premature Negro infants, the prompt improvement with complete healing in 78 days in the case of this patient in whom rickets was extremely severe is possibly the best evidence that I have to offer of the value of phosphorus as an adjunct in the treatment of rickets.

COMMENT

Although Hess,[20] Shipley and his associates,[21] McCollum and his co-workers,[22] Shohl and Bennett [23] and Karelitz and Shohl [24] demonstrated the importance of certain salts of phosphorus in the diet of rats as a factor in the prevention or in the cure of rickets, these salts have been of little value in the control of infantile rickets. Phosphorus is a solid nonmetallic element discovered in 1669 by Brandt,[25] an alchemist of Hamburg, who obtained it from evaporated urine by a secret process. As prepared today it is a translucent, nearly colorless solid, having a waxy luster. It is readily oxidized to either phosphoric (P_2O_5) or phosphorus (P_2O_3) oxide. Both Schuehardt [26] and Santessen [27] assert that only the chemically active yellow phosphorus possesses a pharmacologic action, and there are no known compounds containing it that produce the same or even similar actions unless nascent phosphorus is set free from them. Wegner [1] and others who followed him also concluded that only the elementary phosphorus had a demonstrable effect on growing bone, and in my studies I confined myself to observations of the effect of this element when administered to rachitic patients.

Lovett [28] in 1915 clearly described the roentgenographic appearances in rickets, and Park and Howland [29] in 1920 demonstrated roentgenologically the healing effect of cod liver oil in this disease. Every clinician who is concerned with the diseases of infancy has become

20. Hess, A. F.: Newer Aspects of the Rickets Problem, J. A. M. A. **78**: 1177 (April 22) 1922.

21. Shipley, P. G.; Park, E. A.; McCollum, E. V., and Simmonds, Nina: A Pathological Condition Bearing Fundamental Resemblances to Rickets of the Human Being Resulting from Diets Low in Phosphorus and Fat-Soluble A; the Phosphate Ion in Its Prevention, Bull. Johns Hopkins Hosp. **32**:159 (May) 1921.

22. McCollum, E. V.; Simmonds, Nina; Shipley, P. G., and Park, E. A.: The Production of Rickets by Diets Low in Phosphorus and Fat-Soluble A, J. Biol. Chem. **47**:507 (Aug.) 1921.

23. Shohl, A. T., and Bennett, Helen B.: Metabolism of Calcium and Phosphorus of Rats on Restricted Food Intake, J. Biol. Chem. **74**:247, 1927.

24. Karelitz, Samuel; and Shohl, A. T.: The Effect of Phosphate Added to the Diet of Ricketic Rats, J. Biol. Chem. **73**:665, 1927.

25. Brandt, quoted from the United States Dispensatory, ed. 21, Philadelphia, J. B. Lippincott Company, p. 836.

26. Schuehardt, quoted by Meyer, H. H., and Gottlieb, R.: Pharmacology Clinical and Experimental, tr. by J. T. Halsey, Philadelphia, J. B. Lippincott Company, 1914, p. 405.

27. Santessen, quoted by Meyer and Gottlieb (footnote 26).

28. Lovett, R. W.: The Roentgenographic Appearances in Rickets, J. A. M. A. **65**:2062 (Dec. 11) 1915.

29. Park, E. A., and Howland, J.: Some Observations on Rickets, Arch. Pediat. **37**:411, 1920.

familiar with the roentgenographic appearance of healed rachitic bones. I have offered evidence to support the contention of Schabad and Schloss that the addition of phosphorus to the cod liver oil therapy augments the action of cod liver oil in curing rickets. It brings about a more marked density of the bones and a greater deposition of calcium salts in the juxta-epiphyseal region of the bones than does cod liver oil alone.

My studies further confirm the contention of Wegner [1] and of Schabad [7] that phosphorus is incapable of assisting in ossification in rickets until some other factor has restored the altered calcium metabolism to normal. I am inclined to agree with Schloss [9] and Schabad [7] that when cod liver oil and phosphorus are given together, cod liver oil is the primary active substance, and that phosphorus acts secondarily by augmenting the accumulation that is started by the oil.

In my first group of cases in which phosphorus alone was administered, the increased calcification and the apparent healing of the rickets in case 4 may well have been due to the addition of phosphorus at a time when the summer sunshine had already stimulated or initiated the healing process. The same criticism has been made by Hess and Weinstock [3] and others in connection with the effect noted by Phemister, Miller and Bonar [12] when phosphorus was administered in cases of rickets throughout the summer months. In the cases listed in group 3 there was little if any improvement noted when phosphorus was given alone over a long period during the late fall and winter months. There was rapid healing, and the calcification of the bones seemed to be more pronounced, when phosphorus and cod liver oil were given together, as in group 4, than when cod liver oil was given alone.

The studies of Hess and Weinstock [3] on the value of elementary phosphorus in rickets are open to criticism, as we have previously indicated in this report. Without knowing the weights of the rats, one may question the dosage of the phosphorus in each day's ration. Calculated on a basis of average weights of laboratory rats, these animals in many instances must have received from ten to twenty times as much for each ounce of body weight as would a year old baby. From the recent work of Barnes, Brady and James [30] it is known that rats may be more sensitive to the therapeutic effect of certain substances than an infant would be to the same relative dosage. Kassowitz,[2] in 1884, and other workers since that time have shown that from two to four times the dose of phosphorus that causes osteosclerosis, produces osteoporosis. In the few instances in which smaller doses were used by Hess and Weinstock, the rachitic condition that developed was less marked.

30. Barnes, D. J.; Brady, M. J., and James, E. M.: The Comparative Value of Irradiated Ergosterol and Cod Liver Oil as a Prophylactic Antirachitic Agent When Given in Equivalent Dosage According to Rat Units of Vitamin D, Am. J. Dis. Child. **39**:45 (Jan.) 1930.

In my studies I did not attempt to compare the therapeutic effect of cod liver oil and phosphorus with that of the irradiated cereals of Steenbock and his co-workers [31] or with that of irradiated ergosterol. Hess and his associates [32] recently reviewed the subject of treatment with irradiated ergosterol and confirmed the claims that this preparation is a specific for rickets, tetany and osteomalacia. Hess pointed out, however, that not infrequently preparations of irradiated ergosterol given in adequate doses or even in very large amounts fail to protect rapidly growing premature infants.

The clinical study of Barnes, Brady and James [30] is rather convincing in its evidence that cod liver oil is a more effective prophylactic antirachitic agent than is irradiated ergosterol when given in equivalent dosage according to rat units of vitamin D. These workers concluded:

> Cod liver oil prevented or cured rickets in 98 per cent of the cases studied when given in a dosage of 3 teaspoonfuls daily (1,400 rat units of vitamin D).
>
> A mixture of cod liver oil plus irradiated ergosterol in a dosage of 3 teaspoonfuls (3,750 rat units of vitamin D daily) was just as effective, but there was no evidence of superiority among this group as compared with the group given only cod liver oil.
>
> Irradiated ergosterol in a daily dosage of 1,250 rat units of vitamin D prevented or cured rickets in only 44 per cent of the cases studied. The results in this group were not significantly better than those for the control group of untreated subjects.

During the year 1929, I had an opportunity to see all infants registering at one of the infant welfare clinics of Chicago. Throughout the year the average registration was approximately 200, all being infants under 2 years of age, the average age being about 11 months. From 10 to 20 infants under 2 months of age were registered each month, and 5 of those so registered during the year were infants prematurely born. All of these babies were given cod liver oil containing 0.5 mg. of elementary phosphorus for each fluid drachm, beginning with a few drops and increasing until 3 teaspoonfuls were given each day. The excellent cooperation of the visiting nurses and the constantly reiterated advice of the attending physician made it possible to check up on the mothers and to see that the babies in most instances received the cod liver oil regularly. None of the 5 premature infants at any time presented symptoms or physical signs of rickets; no baby registered in this clinic showed symptoms of deforming rickets during the year. Three infants showed very mild epiphyseal enlargement, slight beading of the ribs and some sweating about the head. In each of these instances, however, the parents had been uncooperative in bring-

31. Steenbock, H.; Riising, Blanche; Black, A., and Thomas, B.: Cereals and Rickets, J. A. M. A. **93**:1868 (Dec. 14) 1929.

32. Hess, A. F.; Lewis, J. M., and Rivkin, Helen: The Status of the Therapeutics of Irradiated Ergosterol, J. A. M. A. **93**:661 (Aug. 31) 1929.

ing the baby to the clinic, and the mothers admitted that they had been negligent in administering the phosphorated cod liver oil because the babies objected to it and it was difficult to make them take it. After the mothers had been convinced of the imperative need for consistent administration of the drug, better cooperation was obtained, and the symptoms of rickets quickly disappeared.

SUMMARY

1. Phosphorus alone was not sufficient medication to bring about healing in severe cases of infantile rickets in which there had been no initial stimulation from ultraviolet light or from cod liver oil.

2. Cod liver oil administered alone to infants with severe rickets, in a dosage of from 3 to 6 teaspoonfuls daily, brought about healing in most of the cases, although in cases 8 and 9 rickets had developed in spite of daily doses of cod liver oil for periods of several months.

3. Phosphorus administered in cases in which cod liver oil had been given and in which its administration was continued and other conditions, such as diet and home hygiene, remained the same, brought about prompt healing of the rickets and increased calcification of the shafts of the bones.

4. When patients had received elementary phosphorus in the form of one-hundredth grain pills (2 such pills each day) for several months without improvement in the roentgenographic appearance of the bones, the healing response to the addition of cod liver oil was slow and the cure of the rickets sometimes delayed for several months, although in every case so studied, healing eventually occurred.

5. The combination of cod liver oil and of phosphorus administered to patients with rickets who had not received previous antirachitic treatment, even though this therapy was begun in the late fall or winter months when the incidence of rickets is known to be high, brought about prompt healing with marked calcification and increased density of all of the bones studied by means of the roentgen rays.

6. The combination of cod liver oil and phosphorus produced more prompt and more certain healing of rickets than did cod liver oil alone.

DIPHTHERIA OF THE UMBILICUS *

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DETROIT

Diphtheria of the umbilicus is a disease that is seldom recognized clinically. In his book, "Diseases of the Umbilicus," Cullen quotes but two cases. In a review of the literature I have been able to find sixty cases described as diphtheria of the umbilicus. These cases could be divided into three classes: (1) those showing no clinical evidence of infection but only positive cultures from a somewhat moist umbilicus, (2) those showing only a slight caseous deposit with positive cultures and (3) those with more extensive evidence of infection.

The case reported here is that of an infant with umbilical diphtheria complicated by diphtheritic myocarditis and diaphragmatic paralysis. A complete postmortem study is given.

REPORT OF A CASE

History.— J. F. McK. was seen in consultation with Dr. Harris on March 29, 1929, at 41 days of age. The family history was essentially unimportant. The child's birth was rather precipitate; the mother was delivered by a practical nurse, who also tied off the umbilical cord. It was later learned that this nurse had lost her own child through diphtheria early in December, 1928.

After the umbilical cord fell off, at about the usual time, there continued to be some discharge, which, however was not of sufficient magnitude to cause any apprehension on the part of the attending physician. Some redness was noted around the umbilicus when the infant was about 3 weeks of age. Later some swelling appeared over the same area and gradually increased in size to that of the palm. Some moist compresses were applied, and the area of redness and swelling seemed to recede gradually. Throughout this period the infant continued to thrive, nursed vigorously and learned to hold up his head. At no time was any fever observed. On the evening before the first examination, the infant became cross and irritable. He slept well during the night, but in the morning he seemed to be very weak, and the mother observed that he no longer held up his head. The attending physician was called and found his temperature to be 101 F. and noted that the area of swelling about the umbilicus seemed a little larger. It was at this time that I was summoned in consultation.

Physical Examination.—The infant's temperature was 98.6 F. by rectum. He was well nourished, but he seemed very weak and had an anxious expression. The respirations were somewhat difficult, and they were entirely costal. No respiratory movement of the abdomen could be noted. The infant could not hold up his head, and the muscular tone of the lower extremities was good.

A brawny, red discoloration of the skin was present about the umbilicus over an area the size of the palm. Directly beneath the umbilicus a mass about the

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size of a walnut could be palpated. In the umbilicus itself was a small fistulous opening, in the depths of which a grayish exudate could be seen. The heart sounds were of fairly good quality. The knee reflexes could not be obtained. The results of the physical examination were otherwise negative. A tentative diagnosis of diphtheria of the umbilicus with postdiphtheritic paralysis of the diaphragm was made.

Course.—The child was removed to the Henry Ford Hospital and given 20,000 units of diphtheria antitoxin intramuscularly. The respirations became more and more labored, and cyanosis developed. He was placed in an oxygen tent, but he became progressively worse. The heart sounds became weak, and he died on March 31. It was observed that the heart stopped beating before the respirations ceased.

Laboratory Observations.—The blood count showed: 4,800,000 red blood cells, 14.3 Gm. of hemoglobin, 18,500 white blood cells, 66 per cent polymorphonuclears,

Fig. 1.—Appearance of the abdomen shortly after death.

33 per cent small monocytes and 1 per cent transitionals. The Wassermann and Kahn tests of the blood were negative. Direct smears and cultures obtained on March 30, 1929, showed numerous *B. diphtheriae* which were subsequently proved to be virulent on inoculation into a guinea-pig. Cultures from the nose and throat were negative for *B. diphtheriae*.

Autopsy.—Autopsy was performed at the Henry Ford Hospital on April 1, 1929, by Dr. Saylor. The essential points were as follows: The abdomen was flat. The umbilicus was 1.75 cm. in diameter and slightly rounded, showing a crescent-shaped area in the center 1 cm. by 3 mm., and immediately around the umbilicus there was a pale, partially denuded, epithelial surface peripheral to which was a yellowish circular area.

The peritoneal cavity contained no free fluid. The intestines were slightly distended, and their walls were smooth and glistening. In the subcutaneous tissue immediately beneath the umbilicus was a large indurated nodule 2 to 3 cm. in diameter which was well surrounded by peritoneum, and to which omentum was adherent. The umbilical vein and arteries were normal in appearance. A section of the inflammatory nodule showed a circumscribed necrotic area 0.6 cm. in diameter surrounded by edematous, pale, fibrous tissue, and the central

portion was a dull greenish gray, and it was broken down in patches. There was no discoloration of the intestinal surfaces. The spleen and bladder were normal in size.

On section, the heart muscle was fairly firm and homogeneous and pale reddish. All of the valves were soft, pliable and competent. The endothelium was smooth, pale and glistening throughout.

The suprarenal glands were equal in size and partially embedded in fat. They each measured 4 by 3 by 1 cm., and on section they showed a thin, pale yellow cortex with intermediate zones fairly prominent and little medullary tissue. There was no gross evidence of hemorrhage.

Microscopic Examination.—The cardiac muscle fibers were fairly well preserved in contour for the most part, although many showed vacuolization and fatty degeneration.

Fig. 2.—Appearance of freshly cut umbilical mass as removed at autopsy.

The capsule of the liver was normal in thickness. The lobulation was not distinct, but the liver landmarks were fairly discernable. The liver cells were smaller and showed vacuolization and granulation of the cytoplasm, especially around the central zones, which were so marked in some areas as to simulate actual necrosis. The peripheral areas were more intact.

The convoluted tubules of the kidneys showed a fairly high grade of parenchymatous degeneration. In some of them the cytoplasm was entirely gone and the lining was ragged with some disintegrated material in the lumen. The glomeruli were numerous and were fairly intact, although some of them did not show their cellular character distinctly. The vessels were practically normal, except for the congestion of some of the smaller capillaries.

Bacteriologic Observations.—Smears and cultures taken from the umbilicus showed Klebs-Löffler bacilli which were pathogenic for guinea-pigs in two days.

Blood from the heart showed Klebs-Löffler bacilli at autopsy.

The final diagnosis was diphtheritic omphalitis, parenchymatous degeneration of the heart and kidneys, central cirrhosis of the liver and septicemia (Klebs-Löffler bacilli).

REVIEW OF THE LITERATURE

For brevity's sake a chart is appended showing the cases that have been found in the literature, with their important observations.

Of the sixty cases found, two were described before the days of bacteriologic technic. The first is somewhat doubtful; the second, that of Hertzka in 1883,[1] was probably an authentic case. But it is impossible to say whether the probable myocarditis and resulting death were results of nasal or of navel diphtheria. One case, that of Hassenstein,[2] must also be deducted because of insufficient data.

There remain forty-two cases of diphtheritic infection of the umbilicus proved by bacteriologic observations. In twenty-two of these there was only a light caseous deposit with a minimum amount of discharge in the umbilicus and positive cultures. Three of the four cases described by Malloy[3] must also be subtracted, as his report contains bacteriologic evidence only. It is assumed that one of his four cases is identical with the case described by Levy[4] in the same bulletin; this case was undoubtedly a true diphtheritic infection of the umbilicus. In the remaining seventeen cases there was a somewhat more extensive inflammation about the umbilicus, and undoubtedly there was true diphtheritic infection. To these should probably be added the case of Hertzka already noted. Hertzka's was the only case that I found in which any clinical evidence was recorded pointing to myocarditis. As I have already stated, however, this child had nasal diphtheria.

One of Prausnitz' patients[5] showed paralysis of the soft palate. This child also had nasal diphtheria. This is the only case that I have found in which there was any conclusive evidence of neurologic complications.

There are several cases in which diphtheria was found not only in the umbilicus but in other parts of the body, particularly in the nose. Gertler's[6] patient had diphtheria of the penis. The large group of cases reported by Schönfelder[7] and reviewed by Comby deserves further explanation, which can best be given by quoting from Comby's article.

"In 1860 a Norwegian, Dr. Moller, saw a case of umbilical diphtheria. In 1919 two epidemics occurred in the maternity hospitals, five cases at Bergen, thirty three at Christiania. At the latter place in

1. Hertzka: Arch. f. Kinderh. **4**:108, 1883.
2. Hassenstein: Deutsche med. Wchnschr. **25**:406, 1899.
3. Malloy, C. R.: Grace Hosp. Bull., October, 1916, vol. 1.
4. Levy, D. J.: Grace Hosp. Bull. **1**:8, 1916.
5. Prausnitz: Berl. klin. Wchnschr. **56**:797, 1919.
6. Gertler: Klin. therap. Wchnschr. **5**:1236, 1898.
7. Schönfelder: Norsk mag. f. lagevidensk. **81**:857, 1920; abstr. by Comby in Arch. de méd. d. enf. **24**:437, 1921.

Table Showing Cases Reported in the Literature with Observations

Author	Date	No. of Cases	Age	Culture	Complications	Anti-toxin	Outcome	Comment
Lowenstamm: Med.-Chir. Centralb. **13**: 89	1878	1	10 days	None	None	None	Recovered	Unproved
Hertzka: Arch. f. Kinderh. **4**: 106	1882	1	7 days	None	Nasal and aural diphtheria, myositis?, laryngeal diphtheria	None	Death	No autopsy, unproved
Toch: Prag. med. Wchnschr. **23**: 401	1898	1	10 days	Positive	None	Yes	Death	
Pitts: Lancet **1**: 955	1897	1	14 days	Positive	None	None	Death	Autopsy was performed
Gertler: Klin.-therap. Wchnschr. **7**: 1236	1898	1	4 weeks	Positive	Diphtheria of the penis	Yes	Recovered	
Hassenstein: Deutsche med. Wchnschr. **25**: 408	1899	1	New-born	?	?	?	?	Unproved
D. J. Levy: Grace Hosp. Bull. **1**: 8	1916	1	New-born	Positive	None	None	Death	No autopsy
C. R. Malloy: Grace Hosp. Bull. vol. 1	1916	4	New-born	Positive	?	?	?	Bacteriologic report only
W. H. Brown: Grace Hosp. Bull. **2**: 13	1918	1	6 days	Positive	?	Yes	Death	No autopsy
Henkel: Deutsche med. Wchnschr. **45**: 1411	1919	4						
(Case 1)			4 days	Smears positive	None	Yes	Recovered	None
(Case 2)			New-born	Smears positive	None	No	Recovered	No symptoms, only discharge
(Case 3)			8 days	Smears positive	None	Yes	Recovered	Same as case 2
(Case 4)			8 days	Positive	None	No	Recovered	Same as cases 2 and 3
Prausnitz: Berl. klin. Wchnschr. **56**: 795-799	1919	7						
(Case 1)			2 weeks	Positive	Paralysis of soft palate, nasal diphtheria		Death	Autopsy, terminal bronchopneumonia
(Case 2)			14 days	Positive	Nasal diphtheria	None	Death	Died 7 hours after observation, no autopsy, complications due to nasal or navel diphtheria ?
(Case 3)			11 days	Positive	Peritonitis	Yes	Death	Autopsy, Staphylococcus peritonitis
(Case 4)			7 days	Positive	Nasal diphtheria	?	Recovered	None
(Case 5)			2 weeks	Positive	None	?	Recovered	None
Marie Snell: Jahrb. f. Kinderh. **89**: 40	1919	7						
(Case 1)			6 days	Positive	Nasal diphtheria		Death	Autopsy, bronchopneumonia
(Case 2)			6 days	Positive	Nasal diphtheria	Yes	Recovered	None
(Case 3)			19 days	Positive	Erysipelas	Yes	Recovered	None
(Case 4)			3 weeks	Positive	Nasal diphtheria	Yes	Recovered	None
(Case 5)			22 days	Positive	None	Yes	Recovered	Not sick, no symptoms whatever, positive culture only
(Case 6)			14 days	Positive	Nasal diphtheria	Yes	Death	Sudden death, no autopsy, terminal pneumonia
(Case 7)			15 days	Positive	Peritonitis	Yes	Death	Autopsy, no note regarding heart
Schönfelder: Norsk. mag. f. lægevidensk. **81**: 877; reviewed by Comby: Arch. de méd. d. enf. **24**: 437	1921							
(Group 1)		30	New-born	Positive	None	?	Recovered	No clinical symptoms
(Group 2)		10	New-born	Positive	None		Recovered	Limited inflammation only
(Group 3)		2	New-born	Positive	None		Recovered	More extensive local inflammation
(Group 4)		1	New-born	Positive at autopsy	Peritonitis	None	Death	Recognized only at autopsy
(Group 5)		1	New-born	Positive	Nasal diphtheria	Yes	Recovered	None

1916, there was but one case of cutaneous diphtheria among 912 reported cases. In 1917 five among 926. In 1919, thirty-two among 1,700." Comby deduces from this that in 1919, as in 1860, diphtheria showed a tendency to attack unusual parts of the body. He says further:

> The Christiania epidemic was initiated by an infant born the thirteenth of April. After having been discharged from the hospital he returned several days later with an umbilicus which was moist and red. The mother had a diphtheritic angina. They were admitted to the contagious hospital. The umbilicus became red and brown over an area as large as a sou. His general condition remained good, but ten days after admission he formed an area of necrosis which became larger and deeper, the diphtheritic nature of the case was not recognized and death occurred fourteen days after admission to the hospital at the age of six weeks. At autopsy diphtheria bacilli were demonstrated and a localized inflammation of the large intestine opposite the umbilicus was found. Between the nineteenth of May and the fifteenth of November thirty-two infants with diphtheria of the umbilicus were recognized. Two of these had *B. diphtheriae* in the nose and throat.
>
> These thirty-three cases could be divided into four groups. In the first group are ten cases which showed no clinical manifestations of diphtheria but showed *B. diphtheriae* on culture. In the second group comprising nineteen cases the umbilicus was the site of a limited ulceration which was covered by a caseous deposit. The third group comprised two cases with more extensive inflammation. The skin was edematous around the umbilicus, which itself protruded like a hazelnut with pus and a false membrane at the surface. The fourth group was composed of two cases the one is the one just discussed, the other also had nasal and pharyngeal diphtheria and was treated by antitoxin and cured. In these cases the gangrenous process penetrated several centimeters below the surface.

Comby points out that diphtheritic infection of the umbilicus does not differ greatly from nonspecific infections of the same region, and urges that bacteriologic examination be resorted to more frequently. He also points out that the disease is rarely febrile, and that the infant may continue to nurse and to gain weight, the majority of these patients having gained weight while in the hospital.

CONCLUSION

The case of an infant with umbilical diphtheria complicated by post-diphtheritic paralysis and myocarditis is reported, with complete bacteriologic and pathologic observations and a brief review of the literature. It has been impossible to discover in the literature another case of diphtheria limited solely to the umbilicus in which there were myocardial or neurologic complications.

ENLARGEMENT OF THE THYROID GLAND IN CHILDREN

A STUDY OF ONE HUNDRED CASES OF SO-CALLED SIMPLE GOITER *

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During the past year an intensive study of the basal metabolism in its relation to enlargement of the thyroid gland has been in progress in our clinic. In this paper we discuss the results of our study of one hundred cases of what is commonly known as simple goiter in children between the ages of 6 and 14.

Marine [1] and his co-workers have shown that the condition of simple goiter is caused by a lack of iodine in the water and food supply and that it can be prevented by feeding small doses of iodine. The condition is endemic in various inland portions of the world, such as the Great Lakes basin and certain cantons of Switzerland. There is reason to believe that proximity to the sea confers a degree of freedom from endemic goiter. Not only are the food and drinking water obtained near the sea more likely to contain the required amount of iodine, but the wafting in of ocean spray is said to contribute to the iodine content. The observation that endemic goiter is least frequent along the seacoast in America and Europe apparently holds true.

The development of simple goiter, however, is not confined to geographic areas. The milder disturbances of the thyroid gland are frequent even in regions supposedly free from endemic goiter. Oleson [2] found 38.3 per cent of thyroid enlargement in girls in a seacoast town of Oregon. Bigelow, Aub and Sisco [3] found a goiter incidence of 22 per cent in school girls of Massachusetts, which is supposedly a non-goitrous state. Reichle [4] noted an incidence of 14 per cent among Irvington school children (Irvington town water has an iodine factor of 67 parts to a billion parts of water). Goldberger and Aldinger [5] and

* Submitted for publication, April 28, 1930.

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1. Marine, D., and Kimball, O. P.: The Prevention of Simple Goiter in Man, J. A. M. A. **77**:1068 (Oct. 1) 1921.

2. Oleson, R.: Pub. Health Rep. **42**:2831, 1927.

3. Bigelow, Aub and Sisco: Pub. Health Rep. **41**:55, 1926.

4. Reichle, H. S.: Arch. Pediat. **43**:329, 1926.

5. Goldberger, I. H., and Aldinger, A. K.: Goiter Incidence of School Girls in New York City, Am. J. Dis. Child. **29**:780 (June) 1925.

Cohen,[6] in an examination of a large number of school children in New York City (the water supply of which has from 110 to 250 parts of iodine to 1,000,000,000 parts of water), found that more than 3 per cent had a moderate or marked enlargement of the thyroid gland. When one considers that the goiter regions of the middle west range from 2 to 20 parts of iodine to 1,000,000,000 parts of water, one realizes that simple goiter is not entirely a question of climate or altitude or of food or water supply.

The ultimate cause of the enlargement of the gland is unknown. As a rule, the function of the gland is finally fairly normal, the enlargement being the only symptom of the disturbance. The enlargement of the gland may result from any factor that increases the iodine needs of the organism, causing a relative or an absolute iodine deficiency. Such increased needs occur during puberty, menstruation, pregnancy, lactation and the climacterium, and it is during these periods of metabolic stress that the condition of simple goiter usually develops, in all races, all climates and all parts of the world.

In this paper we include one hundred cases of simple goiter in children born and brought up in New York City. We cannot say what percentage of a total they represent, but at least 90 per cent of these patients came to us within the past year. We consider this a large number in a supposedly goiter-free region.

The accompanying table gives the essential data. The cases are arranged by age, which is recorded in years and months. The standing height of the subject was measured in inches and in centimeters, without shoes. The weight was taken in kilograms, with the subject dressed in indoor clothing but without shoes. The condition of nutrition was measured by the Pirquet pelidisi.[7] Chart 1 shows the basal metabolic rate measured by the Pirquet sitting-height standard,[8] which we found the best single prediction standard in all cases. Chart 2 shows how the average height of our children, measured in inches, compares with the standards of Baldwin and Wood,[9] Holt [10] and Crum and Wood.[11]

6. Cohen, E.: Goiter in Children in New York City, Am. J. Dis. Child. **31**: 676 (May) 1926.

7. von Pirquet, C.: System der Ernahrung, Berlin, Julius Springer, 1919, pt. 2, p. 284.

8. von Pirquet, C.: An Outline of the Pirquet System of Nutrition, Philadelphia, W. B. Saunders Company, 1922.

9. Baldwin and Wood: Weight-Height-Age Tables, Mother & Child **4**:337 (July) 1923.

10. Holt, E. L.: Diseases of Infancy and Childhood, New York, D. Appleton & Company, 1920.

11. Gray and Gray: Collected Figures of Crum and Wood, Boston M. & S. J. **177**:894, 1917.

Essential Data in 100 Cases of Simple Goiter

Case	Age Yr.	Age Mo.	Sitting Height Cm.	Height In.	Height Cm.	Weight, kg.	Pelvidist	Pulse Rate	Basal Metabolism Total Calories Observed	Basal Metabolism Total Calories Predicted from Pelvidistance	Variation, %	Comment
1	6	0	63	46	115.0	19.5	93	60	692	793	−13	
2	6	4	66.5	46½	116.0	21.5	92	80	806	858	−6	
3	6	6	66	47½	119.0	28.0	100	75	888	871	+ 2	
4	7	..	69	51	127.5	24.0	91	72	958	952	— 1	
5	7	2	66	48	120.0	23.2	94	68	793	871	— 9	
6	7	3	66	50	125.0	23.9	94	66	800	871	— 8	
7	7	4	67	52	130.0	27.0	97	78	799	897	—12	
8	7	4	69	50	125.0	25.0	93	64	936	959	— 2	
9	7	5	66	50	125.0	24.3	91	68	840	871	— 4	
10	8	..	72	52	130.0	30.0	94	72	1,000	1,036	— 3	
11	8	..	69	50	125.0	24.0	91	64	800	871	— 9	
12	8	..	67	51	127.5	24.5	94	70	930	897	+ 7	
13	8	3	69	51	127.5	23.0	100	70	1,008	959	+ 6	
14	8	7	72	52	132.0	26.0	89	78	980	1,009	— 3	
15	9	..	70	53	137.5	28.5	93	90	1,104	1,130	— 3	
16	9	..	74	54	140.0	33.4	94	70	1,008	1,080	— 8	
17	9	..	70	58	146.0	36.1	80	70	1,101	1,130	— 3	
18	9	..	69	53	140.0	33.5	101	66	891	954	— 4	
19	9	3	67	54½	130.0	27.3	97	60	804	897	— 4	
20	9	3	70	55	133.5	27.3	95	72	913	980	— 7	
21	9	4	73	54½	136.0	40.0	105	66	960	1,036	+ 7	
22	9	6	80	58	145.0	42.0	94	72	1,248	1,280	— 2	
23	10	..	72	56½	134.0	32.3	96	68	936	1,036	—10	
24	10	..	72	54	135.0	29.0	92	72	1,008	1,036	— 3	
25	10	2	70	54	135.0	27.1	93	60	804	980	—18	
26	10	3	72	54	135.0	25.0	88	70	1,036	1,036	0	
27	10	3	75	57	142.5	39.0	98	66	984	1,125	—12	
28	10	4	76	61	152.5	37.0	95	68	1,063	1,155	— 8	
29	10	7	71	56	140.0	37.4	102	90	1,128	1,008	+11	
30	10	8	78	60	150.0	39.5	95	78	1,248	1,216	+ 3	
31	10	9	79	62	155.0	55.0	104	80	1,240	1,248	0	
32	11	..	75	56	140.0	36.5	96	72	1,154	1,125	+ 3	
33	11	..	78	55	137.5	30.0	86	70	1,128	1,216	— 7	
34	11	..	75	59	147.5	45.0	103	72	1,105	1,125	— 2	
35	11	..	76	60	150.0	36.0	94	64	1,120	1,155	— 3	
36	11	..	79	61	155.5	38.0	92	68	1,296	1,248	+ 4	
37	11	2	74	60	150.0	43.0	103	70	1,036	1,095	— 1	
38	11	2	75	56	140.0	36.5	96	76	1,080	1,125	— 4	
39	11	9	79	60	150.0	44.0	97	64	1,164	1,248	— 7	
40	11	3	74	58	145.0	33.0	97	82	1,008	1,036	— 3	
41	11	4	75	57½	144.0	31.4	91	80	1,076	1,125	— 4	
42	11	5	76	60	150.0	36.5	94	82	1,384	1,155	+11	Tremor; nervousness; slight exophthalmos
43	11	5	76	60	150.0	39.0	93	76	1,296	1,248	+ 5	
44	11	5	76	56	140.0	38.4	87	66	1,104	1,155	— 5	
45	11	6	75	60	150.0	41.0	103	88	1,160	1,080	+ 6	
46	11	6	77	58	145.0	35.0	93	78	1,143	1,186	— 4	
47	11	6	80	61	152.5	38.0	91	60	1,160	1,280	— 9	
48	11	8	76	60	147.5	37.0	95	90	1,300	1,155	+13	
49	11	9	75	55	137.5	31.0	91	80	1,104	1,155	— 5	
50	12	..	84	61½	150.0	51.5	97	84	1,500	1,411	+ 6	Menses 10 months
51	12	..	79	60	150.0	39.0	93	80	1,296	1,248	+ 4	
52	12	..	80	62	155.0	37.0	90	70	1,216	1,280	— 5	
53	12	..	77	59	147.5	41.0	97	82	1,248	1,186	+ 6	
54	12	..	73	56	140.0	34.0	96	90	1,225	1,065	+15	Nervousness
55	12	..	78	58	145.0	34.0	90	90	1,440	1,216	+18	Nervousness
56	12	..	78	61	152.5	54.0	105	64	1,096	1,216	—10	
57	12	1	75	56	140.0	33.2	93	88	1,248	1,125	+11	
58	12	2	78	61	152.5	37.0	93	90	1,368	1,216	+13	
59	12	2	79	60	150.0	50.0	101	96	1,392	1,248	+12	
60	12	2	84	63	157.5	53.0	97	88	1,580	1,411	+12	
61	12	3	78	62½	156.0	48.0	101	70	1,250	1,216	+ 3	Menses 10 months
62	12	4	79	62	155.0	45.7	98	74	1,440	1,248	+15	Menses 1 month
63	12	4	80	62	155.0	44.5	96	72	1,076	1,280	—16	Menses 1 year
64	12	5	80	62	155.0	50.0	100	88	1,436	1,280	+12	Menses 1 month
65	12	8	80	61½	154.0	46.0	97	80	1,200	1,280	— 7	Menses 8 months
66	12	10	81	60	150.0	40.0	92	90	1,440	1,312	+10	
67	12	10	83	62	155.0	41.0	90	100	1,635	1,377	+20	Tremor; nervousness

Essential Data in 100 Cases of Simple Goiter—Continued

Case	Age Yr.	Age Mo.	Sitting Height Cm.	Height In.	Height Cm.	Weight, kg.	Pelvic Index	Pulse Rate	Basal Metabolism Total Calories Observed	Basal Metabolism Total Calories Pignet Prediction	Basal Metabolism Total Calories Variation %	Comment
65	13	..	83	61½	154.0	41.0	90	90	1,616	1,377	+10	No menses
66	13	..	85	62	155.0	54.8	95	76	1,357	1,445	−6	Menses 1 year
67	13	..	80	63	157.5	41.0	94	60	1,080	1,280	−16	
70	13	..	85	66	165.0	47.8	92	60	1,250	1,445	−14	
71	13	..	84	60	150.0	55.2	97	72	1,548	1,410	−4	Menses 8 months
73	13	..	84	60	150.0	55.2	97	72	1,548	1,410	−4	Menses 7 months
74	13	..	87	66	165.0	84.0	100	68	1,502	1,513	−10	Menses 2 years
75	13	..	83	60	150.0	45.8	92	70	1,378	1,377	−7	Mental defective; no menses as yet
76	13	..	78	60	150.0	50.0	102	72	1,154	1,216	−5	Menses 2 years
77	13	..	84	63	157.5	70.0	100	80	1,560	1,411	+10	Menses 2 years
78	13	..	79	62	155.0	37.5	92	90	1,440	1,248	+15	Menses 3 months
79	13	..	81	62	155.0	47.0	97	72	1,380	1,314	−1	Menses 1 year
80	13	..	81	63	157.5	44.0	95	60	1,245	1,312	−5	Menses 2 years
81	13	..	82	63	157.5	52.3	99	64	1,248	1,344	−7	Menses 2 years
83	13	..	79	62	155.0	50.0	91	68	1,280	1,248	+3	Menses 1 year
84	13	..	82	62	157.5	44.0	95	72	1,230	1,377	−3	Menses 8 months
85	13	1	82	64½	161.0	46.0	91	100	1,015	1,245	+15	No menses; tremor; nervousness
87	13	3	72	60½	151.0	36.0	103	72	1,335	1,310	+1	Menses 10 months
90	13	9	70	60	150.0	36.0	96	108	1,511	1,155	+30	No menses; tremor; nervousness
97	13	6	80	63	160.0	50.0	105	100	1,500	1,500	+15	Menses 1 month; nervousness
93	13	6	81	62	155.0	46.0	95	90	1,405	1,312	16	Menses 3½ years
89	13	8	80	60	150.0	46.0	97	87	1,153	1,280	10	Menses 3 years
96	13	8	80	61	152.5	44.3	96	88	1,296	1,280	+1	Menses 8 months
91	13	8	84	63½	158.0	57.3	86	70	1,372	1,411	10	Menses 1 year
92	14	..	76	60	150.0	34.0	92	70	1,052	1,155	11	Mentally and physically retarded; no menses
93	14	..	85	60	150.0	55.5	97	76	1,316	1,445	9	Menses 2 years
94	14	..	85	66	165.0	54.8	97	64	1,312	1,445	9	Menses 2 years
95	14	..	80	62	155.0	52.0	101	70	1,201	1,280	7	Menses 3 years
96	14	2	83	63	157.5	50.0	96	72	1,252	1,377	9	Menses 1 year
97	14	4	84	64	160.0	45.5	92	96	1,440	1,411	+2	Menses 1 year
98	14	4	83	63	157.5	43.8	92	86	1,380	1,377	0	Menses 2 years
99	14	4	78	61	155.5	49.5	102	70	1,200	1,216	−1	Menses 1½ years
100	14	4	82	63	157.5	48.0	96	80	1,344	1,348	0	Menses 2 years

The Krogh calorimeter was used in the first half of the study and the Benedict-Roth calorimeter in the second half, the two machines having been checked for accuracy and accord. The usual accepted technic was adopted as to the post-absorptive state and the initial rest period. All determinations were made in duplicate, each test lasting five or six minutes. As temporary nonbasal elevations of metabolism may be caused by slight disturbing conditions such as discomfort, excitement, muscular movement, surreptitious ingestion of food and rise in temperature, we were careful to exclude these factors as far as possible by making four tests on each child, the first two being considered as practice tests.

RESULTS WITH COMMENTS

Most of our patients (ninety-three) were girls. There is no satisfactory explanation of the fact that the female is much more liable to disturbances of the thyroid gland than the male. The female gland evidently possesses a potential variation of function that might cause a lack of stability. Also, puberty occurs earlier in girls than in boys, and as our pediatric clinic has an age limit of 14, we are less likely to see as many boys in puberty. The fact remains, however, that all investigators find the condition of simple goiter from four to ten times as frequent in the female as in the male, in all regions.

While this type of goiter may occur at any age, the majority of our cases occurred between the ages of 11 and 14. In most cases we could not trace the duration of the enlargement; the greatest goiter incidence, however, is during the period of adolescence, a fact that gives this type of goiter its name. An activation of the thyroid gland is one of the

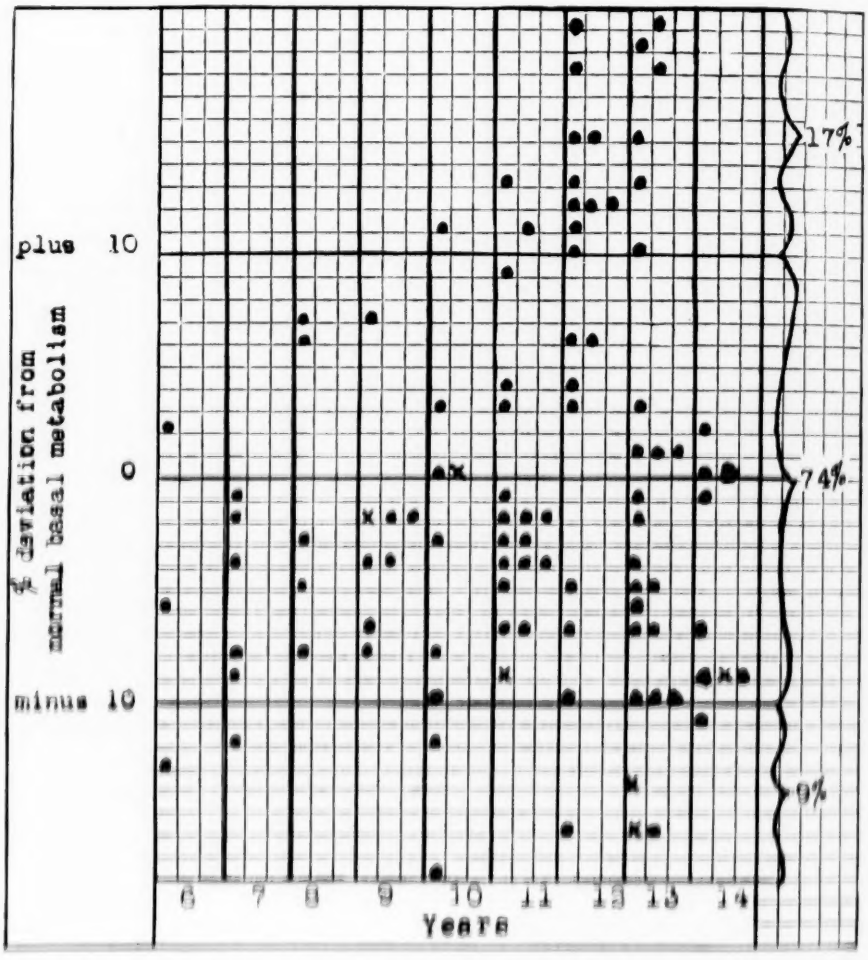

Chart 1. Basal metabolism of children with simple goiter, according to the von Pirquet standard. + indicates boys; the thick dots, girls. Of the 74 per cent between plus and minus 10, 23 per cent were plus and 51 per cent minus.

most marked of the endocrine phenomena of puberty and its antecedent stage. In goitrous regions, the administration of a tablet containing $^{1}/_{10}$ grain (6.5 mg.) of iodine once a week throughout the school year, between the tenth and sixteenth years of life, is under the direction and control of the medical inspectors of schools.

Chart 1 shows that 74 per cent of our patients had a normal basal metabolic rate, that is, a rate that fell between plus 10 and minus 10; 17 per cent had a basal metabolic rate above plus 10 and 9 per cent, below minus 10. Plummer [12] said that in the majority of cases of simple goiter in this country the basal metabolic rate ranges from 8 to 18 per cent below the normal average. Boothby [13] found the basal metabolic rate in such cases toward the lower limits of normality and down to minus 15 per cent, and he decided that a mild or potential hypothyroidism is present in all cases of simple goiter. Our results corroborate

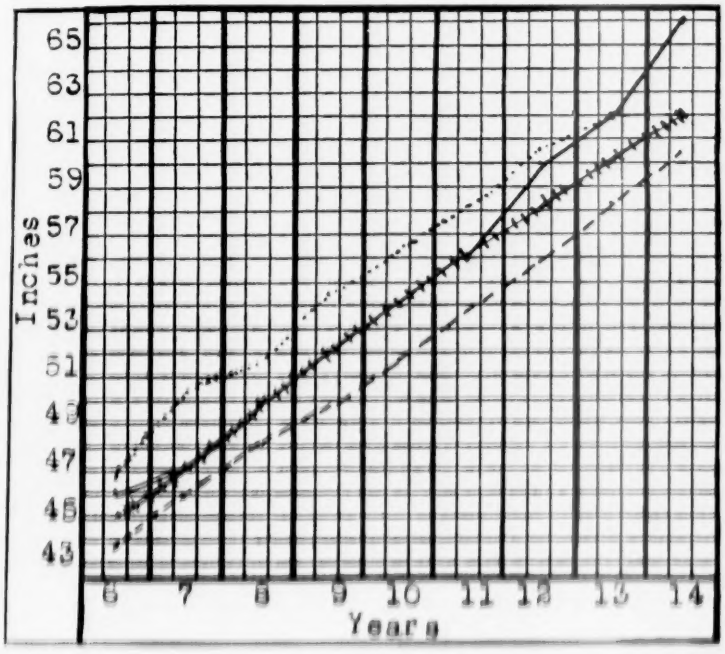

Chart 2.—Relationship between age and height of girls. The dotted line represents the curve from our studies of girls with goiter; the dash line, that for the studies of Holt with normal girls; the crossed line, that of Baldwin and Wood for normal girls, and the continuous line, that of Crum and Wood for normal girls.

a degree of hypothyroidism. Of our 100 cases, 91 per cent show a minus variation, while only 40 per cent show a plus variation.

The essential known function of the thyroid gland is elaboration and delivery to the blood of a secretion containing the active thyroxin which is used as a catalytic agent in the processes of oxidation. Thy-

12. Plummer, H. B.: Oxford Medicine Rewritten, London, Oxford University Press, 1923, vol. 3, p. 831.

13. Boothby, W. H.: Collected Papers, Mayo Clinic **20**:490, 1928.

roxin hastens chemical activity of all cells, the intensity of which can be judged from the heat produced as a by-product of all chemical reactions. Basal metabolism is a term used to measure the amount of heat thus produced. It depends, therefore, on the amount of thyroxin in the tissues. Normally, there is 14 mg., and this amount varies within very narrow limits. A shift of 1 mg. causes a corresponding shift of 2.8 per cent in the basal metabolism. The amount of thyroxin in the tissues may be below normal either from temporary or permanent disability of the thyroid gland, or from physiologic conditions in which the normal gland is not stimulated to deliver sufficient thyroxin to maintain the normal amount in the body; as happens, for example, in severe malnutrition, in which there is a gradual lowering of the thyroxin content of the body, with consequent lessening of chemical activity of the cells with a lessened heat production and a consequently lower basal metabolism.[14] It is also possible that sustained stress or toxic damage to the thyroid gland may exhaust thyroxin more rapidly than it can be produced, and the basal metabolism falls. Such periods of sustained stress exist in fetal life, during adolescence, menstruation, pregnancy, lactation and the menopause. Such toxic damage may occur during certain infections.[15]

As all the people of a given locality are exposed to practically the same climatic and physiologic conditions, we can assume an individual difference in the functional capacity or efficiency of the thyroid gland to account for the fact that not all those subjected to these periods of sustained stress develop enlargement of the thyroid gland. An inferior organ, which under ordinary conditions may be able to perform its function tolerably well, may be unable to meet increased demands, and this necessarily results in enlargement. Enlargement should probably be regarded, then, as an increase of activity in a constitutionally inferior organ.

The majority of cases of simple goiter occur during adolescence. This is not difficult to understand. The period of puberty and its antecedent stage are accompanied by many and profound physical, psychic and physiologic changes. It is the period during which the changes in sex are most marked, and the most active physical growth occurs. It is the period during which, as Biedl[16] so aptly said, in the orchestra of the endocrine organs the thyroid for the moment has the solo part.

14. Topper, Anne, and Muller, Hannah: Basal Metabolism of Children of Abnormal Body Weight, J. A. M. A. **92**:1903 (June 8) 1929.

15. Schick, Bela, and Cohen, Philip: Lowered Basal Metabolism, Am. J. Dis. Child. **30**:291 (Sept.) 1925. Schick, Bela; Cohen, Philip, and Beck, Isabelle: The Basal Metabolism After Pneumonia, Am. J. Dis. Child. **31**:228 (Feb.) 1926.

16. Biedl, A.: Verhandl. d. 34 Deutsche Kong. f. inn. Med., 1922.

From our study of simple goiter we are inclined to think that rapidly growing children, in fact tall children, are most likely to develop enlargement of the thyroid gland. Chart 2 shows how the height of our children compares with the normal expected height for the same age. It will be seen that our children, up to 13 years of age, are taller than the average children of the same age. There is other evidence to show that height is actually increased in the presence of simple goiter. Hill, Brett and Smith,[17] in studying goiter in adolescents in England, found, strikingly, that many of the patients were overgrown and above the average height for their age. Oleson,[18] in studying the goiter incidence among the school children of Cincinnati, found that the girls between the ages of 11 and 13 with goiter were taller than those without goiter. Also, their average sitting height was greater. Growth is accompanied by great chemical activity which may result in an increased demand of the body for thyroxin and other incretions. Whether the increase in height is the result of thyroid hyperactivity, or whether a goiter is especially liable to occur in overgrown persons, is a question that cannot yet be decided.

It is unfortunately true, also, that this important difficult period of puberty coincides with the period of greatest strain in school and in outside activities. A long school day and additional hours of study at home, in many cases, certainly with our children, insufficient rest, poverty, unhygienic living conditions and unbalanced diets, and in all cases mental and sexual readjustments, are indirect contributing causes of sustained metabolic stress.

In the prevention of simple goiter, iodine has offered striking results. As treatment, however, iodine plays a very small rôle in these cases. We have followed many of our cases very carefully; in some, we used no medication, in some, iodine, in others, small doses of thyroid, and the reduction in the size of these glands remains only partially successful at best. If there is a remedy, it lies along prophylactic lines. The physiologic, psychosexual and mental problems of the adolescent cannot be eliminated, but other factors may be the elimination of many hours of study at school and at home, a well balanced and sufficient diet, ample rest and perhaps iodine medication even in nongoitrous districts, should the percentage of goiters in these districts warrant such therapy. The tendency of thyroid enlargements to occur in families suggests the advisability of prophylactic treatment during pregnancy and lactation. In fact, Marine[19] suggested the state-wide use of a salt containing

17. Hill, Brett and Smith: Quart. J. Med. **18**:133, 1925.

18. Oleson, R.: Pub. Health Rep. **41**:971, 1926.

19. Marine, D.: Glandular Therapy, Chicago, American Medical Association Press, 1927, p. 34.

from 0.005 to 0.01 per cent of sodium or potassium iodide. He expressed the belief that the state-wide use of such a salt both for cooking and for table use would protect all the inhabitants.

Chart 1 shows that 17 per cent of our children had a basal metabolic rate above plus 10 per cent. These cases were in the higher age groups, from 11 to 13. Talbot [20] also found that thyroid enlargement was associated at puberty with an increased basal metabolism. We believe this rise in basal metabolism to be a manifestation of puberty present in most children with or without thyroid enlargement. We found this rise in our series of underweight as well as in our overweight children.[21] We are studying a series of normal children at intervals of six months, and we have reason to believe that in most children at the time of puberty there is a revolution in the orchestra of internal glands which may involve other organs also; thus there are symptoms of overactivity of the thyroid gland, nervousness, tremor and tachycardia, all of which we have reason to believe pass away as soon as puberty is well established. In our present series, several children who had shown a low metabolic rate and no other signs of thyroid enlargement suddenly began to have symptoms of thyroid overactivity at puberty—nervousness, tremor and tachycardia and in some cases a functional cardiac murmur and an increased basal metabolism. These children were watched carefully at short intervals, and as puberty was well established, the symptoms disappeared and the basal metabolism fell to its previously low rate. These cases will be discussed more fully in a later article.[22]

The significance of these observations lies in the fact that for some of these children a diagnosis of cardiac disease or exophthalmic goiter may be made, and the gland may be subjected to destructive treatment by the roentgen ray, radium or even surgical intervention. As the children present a visible thyroid gland, several of the cardinal symptoms of exophthalmic goiter, such as tachycardia, nervousness, tremor and a basal metabolic rate increased above the usually accepted normal limit of plus 10 per cent (we have seen a slight exophthalmos in one case), may readily be mistaken for the more serious condition and accordingly the wrong treatment may be used. We cannot over emphasize the seriousness of the possibility of such an error in diagnosis. A real case of exophthalmic goiter is rare in childhood, and the diagnosis should not be made before the elimination of the condition of a disturbance of the endocrine system, more especially of the thyroid gland during puberty, which is a temporary condition and usually has an excellent prognosis.

20. Talbot, F.: Arch. Pediat. **39**:12, 1926.

21. Topper, Anne, and Mulier, Hannah: Basal Metabolism in Children of Abnormal Body Weight, Am. J. Dis. Child. **38**:299 (Aug.) 1929.

22. Topper, Anne, and Mulier, Hannah: Unpublished data.

SUMMARY AND CONCLUSIONS

Data are presented for one hundred cases of thyroid enlargement (so-called simple goiter) in children between the ages of 6 and 14 years. The outstanding observations were briefly:

1. The condition of simple goiter is much more frequent in girls than in boys. Our series included ninety-three girls and seven boys. As puberty occurs later in boys than in girls, and as our pediatric clinic excludes children over 14, this may account in part for the fact that we had so few boys. Other investigators give the sex ratio as from 4:1 to 10:1.

2. The basal metabolism was normal in 74 per cent.; 17 per cent had a basal metabolic rate above plus 10 per cent; 9 per cent, below minus 10 per cent. The iodine factor in our water supply is from 110 to 250 parts to 1,000,000,000 parts of water, that in the goiter regions of the Middle West being only from 2 to 26 parts to 1,000,000,000 parts of water. The condition of simple goiter in this city is, therefore, surely not due to a lack of iodine in the food or water supply, but rather to exhaustion of the normal amount of thyroxin in the tissues due to sustained metabolic stress. The basal metabolism, which is the index of the amount of thyroxin in the tissues, is consequently lowered. In the majority of our cases, the basal metabolic rate tended toward a low normal and down to minus 18 per cent, showing that simple goiter is nearly always associated with a degree of hypothyroidism.

3. The greatest age incidence of simple goiter in girls is between 10 and 14, the period of puberty and its antecedent state. During this period, profund physical, psychic and physiologic changes are taking place. It is the period of greatest growth. It is the time of greatest activation of the endocrine glands, more especially of the thyroid gland. In addition to these cases of metabolic stress, one must recognize indirect contributing causes of strain, such as long school hours, many hours of home work and, in many cases, certainly in ours, poverty, unbalanced and insufficient diet, unhygienic living conditions and insufficient rest.

4. Treatment for simple goiter after the condition has been established is, on the whole, unsatisfactory. The remedy lies along prophylactic lines. We cannot eliminate the physiologic, psychosexual and mental problems of adolescence, but to a certain extent we can influence the indirect contributing causes of sustained metabolic stress.

5. The height of our children is greater than the height of normal children of the same age (chart 2). Whether goiter develops in tall children or whether the increase in height is the result of thyroid overactivity is a question that cannot yet be decided.

6. Sixteen per cent of our patients had a basal metabolic rate above plus 10 per cent. These subjects were between the ages of 11 and 13, the age of puberty. We believe this increased basal metabolic rate to be an almost constant observation during puberty. Sometimes this is the only sign of a revolution in the endocrine system; at other times, it may be associated with other symptoms of thyroid overactivity. These observations are significant. As these subjects present such symptoms as nervousness, tremor, tachycardia, an increased basal metabolic rate and an enlarged thyroid gland, the picture may be mistaken for that of exophthalmic goiter, and the gland may be subjected to destructive treatment by the roentgen ray or even to surgical intervention. Exophthalmic goiter is rare in childhood, and the diagnosis should not be made before elimination of the condition of physiologic hyperthyroidism of puberty, which is temporary and usually has an excellent prognosis.

STUDIES IN IMMUNITY

III. THE EFFECT OF DISEASES OTHER THAN DIPHTHERIA ON THE SCHICK TEST *

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According to Bessau, Schwenke and Pringsheim,[1] Renault and Levy,[2] Lereboullet, Marie and Brizard,[3] there is no change in the Schick test during the course of measles. Moshage and Kolmer [4] deduced from studies with the Schick test that there was an increased susceptibility to diphtheria in persons suffering from scarlet fever. Zingher [5] found twice as many positive reactions to the Schick test in patients with scarlet fever as in normal persons and three times as many in patients with poliomyelitis; he also noted that patients with measles had a somewhat increased number of positive reactions as compared to a normal group. Zingher did not believe that this was a temporary effect caused by these diseases, as some of his patients who had a positive reaction to the Schick test during the acute stage of a disease, had positive reactions when tested as late as the sixth or eighth week of convalescence. This, he thought, pointed rather to the fact that susceptibility to one of the contagious diseases indicates that the child is also more apt to be susceptible to other contagions and infectious diseases. In further support of this lack of ability to develop immunity, he cited similarity in families in the incidence of positive or negative reactions to the Schick test and he did not believe this is due to lack of exposure and therefore opportunity to acquire immunity.

* Submitted for publication, April 19, 1930.

* From the B. K. Rachford Department of Pediatrics of the College of Medicine of the University of Cincinnati.

1. Bessau, G.; Schwenke, J., and Pringsheim, J.: Jahrb. f. Kinderh. **81**:293 (April) 1915.

2. Renault, J., and Levy, P. P.: Bull. et mém. Soc. méd. d. hôp. de Paris **44**: 816 (June 11) 1920.

3. Lereboullet, P.; Marie, P. L., and Brizard: Bull. et mém. Soc. méd. d. hôp. de Paris **45**:1210 (July 29) 1921.

4. Moshage, Emily L., and Kolmer, J. A.: The Schick Toxin Reaction for Immunity in Diphtheria, Am. J. Dis. Child. **9**:189 (March) 1915.

5. Zingher, A.: The Schick Test in Poliomyelitis, Scarlet Fever, Malaria and in Normal Children, Am. J. Dis. Child. **13**:247 (March) 1917.

We [6] became interested in the effect of diseases other than diphtheria on the Schick test during the course of our studies on the tuberculin reaction.

The diphtheria toxin employed was obtained from reliable sources and was proved to be active by testing on known positive reactors. It was diluted just prior to its use and control tests were made with diluted toxin which had been heated to 75 C. for ten minutes. The control tests were later discarded as unnecessary except in doubtful cases. Tests were made during the acute febrile stage of the several diseases shown in the following table and again in the same patients during convalescence. The patients were children in the pediatric and contagious wards of the Cincinnati General Hospital. The skin reaction was not read finally until the fourth day after the toxin had been

Schick Test During Acute and Convalescent Stages of Diseases in the Same Patients

Disease	Number Cases	Febrile Stage		Convalescent Stage	
		Number Positive	Per Cent Positive	Number Positive	Per Cent Positive
Measles	103	53	51	54	52
Scarlet fever	186	95	51	96	51
Poliomyelitis	15	10	66	13	87
Varicella	20	6	30	10	50
Pertussis	30	19	66	19	66
Miscellaneous	5	0	0	1	20
Total	358	183	51	193	54

injected intracutaneously and, for the purpose of this study, was considered positive only when its diameter was at least 1 cm., and it had clearly defined edges.

According to the table there is little if any difference in the Schick test during the acute febrile stage and the convalescent stage in measles and scarlet fever. The other diseases were studied in numbers too small to permit any conclusion. We also divided the patients in age groups, and plotted the incidence in this manner against the usual incidence of positive Schick reactions at the various ages. There was no significant difference, and we felt that our study did not contain any evidence which might help to add support to or to refute the statements of Moshage and Kolmer and of Zingher which have previously been quoted.

6. Mitchell, A. G.; Wherry, W. B.; Eddy, Bernice, and Stevenson, E. L.: Studies in Immunity: I. Nonspecific Factors in Influencing the Reaction of the Skin to Tuberculin, Am. J. Dis. Child. **36**:720 (Oct.) 1928. Eddy, Bernice, and Mitchell, A. G.: Studies in Immunity: II. The Effect on the Skin Tuberculin Reaction of Nonspecific Factors, ibid. **40**:771 (Oct.) 1930.

CONCLUSION

Diseases such as measles and scarlet fever do not affect the Schick test; that is, there is no difference between the skin reaction to diphtheria toxin during the acute febrile and the convalescent stages of these diseases.

STUDIES IN IMMUNITY

IV. THE EFFECT OF DISEASES OTHER THAN SCARLET FEVER ON THE DICK TEST *

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In the course of our studies on the tuberculin test and the Schick test,[1] we found that certain nonspecific factors influenced the former, but had little effect on the latter. We were interested in studying the Dick test in the same manner.

The toxin used in this work was secured through the courtesy of Dr. George F. Dick and Dr. Gladys H. Dick. It was diluted 1:1,000 with sterile 0.85 per cent sodium chloride solution within eight hours of its use. One tenth of a cubic centimeter of the diluted toxin was injected intracutaneously and the readings were made in from eighteen to twenty-four hours. At the beginning of the study, control tests were performed with diluted toxin which had been heated in a boiling water bath for an hour. Later the practice of performing control tests was discarded, as it was felt that they were unnecessary. The Dicks [2] mentioned common errors of technic in the performance of skin tests, all of which we feel were obviated in the present study. They stated that the slightest flush or reddening, no matter how faint the color, constitutes a positive reaction if it measures as much as 10 mm. in any diameter. In our own work, only reactions in which the erythema was at least 1.2 cm. in diameter were considered positive.

In table 1 is shown the results of the Dick test during the acute febrile stage of several diseases as compared to the results of tests on the same patients during convalescence. As far as these figures go, there seems to be a depression of skin response during the acute stage which occurs in less than 10 per cent of the patients.

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1. Mitchell, A. G.; Wherry, W. B.; Eddy, Bernice, and Stevenson, F. E.: Studies in Immunity: I. Nonspecific Factors Influencing the Reaction of the Skin, Am. J. Dis. Child. **36**:720 (Oct.) 1928.

2. Dick, G. F., and Dick, Gladys H.: The Control of Scarlet Fever, Am. J. Dis. Child. **38**:905 (Nov.) 1929.

Kleinschmidt [3] and Cooke [4] noticed an absence or a quantitative depression of skin response to scarlet fever toxin during the acute stage of measles. Paraf [5] found that patients who had positive reactions to the Dick test during the acute stage of measles might later have negative reactions when they were suffering from complications. According to him, the change in reaction was due to an immunity produced by the *Streptococcus* responsible for the complication. Henryka Frankel and Anna Margolis [6] asserted that the Dick test was not influenced by such diseases as typhus fever, diphtheria and pneumonia. Nobel and Schönbauer,[7] who tested 42 children suffering from various intestinal and infectious diseases, found the Dick test unchanged in 39; in 2 it became negative, and in 1, the test was doubtful.

TABLE 1.—*Dick Tests During Acute and Convalescent Stages of Diseases in the Same Patient*

Diseases	Number of Cases	Febrile Stage		Convalescent Stage	
		Number Positive	Per Cent Positive	Number Positive	Per Cent Positive
Measles	139	42	32	55	42
Diphtheria	59	20	34	18	30.5
Poliomyelitis	14	4	28.5	6	43
Varicella	41	8	19.5	14	34
Pertussis	54	17	31	22	41
Miscellaneous	13	2	15	3	23
Total	310	93	30	118	38

Our own studies, while including observations on a larger number of patients than most others previously reported, do not warrant definite conclusions but seem to indicate that in certain diseases there may be a depression of skin response to scarlet fever toxin during the acute stage. This occurred in less than 10 per cent of the patients we studied.

We were able to observe 45 children whom we had tested within six months before the onset of the acute disease. Seventeen of them had had positive Dick tests. The effect of the acute disease on the Dick test is shown in table 2.

3. Kleinschmidt, H.: Klin. Wchnschr. **4**:2334 (Dec. 3) 1925.

4. Cooke, J. V.: Scarlet Fever: III. Modification of Skin Sensitivity to Toxin as a Result of Nonscarlatinal Infections, Am. J. Dis. Child. **35**:772 (May) 1928.

5. Paraf, J.: Bull. et mém. Soc. méd. d. hôp. de Paris **50**:506 (March 19) 1926.

6. Frankel, Henryka, and Margolis, Anna: Ztschr. f. Kinderh. **41**:302 (June) 1926.

7. Nobel, E., and Schönbauer, F.: Ztschr. f. Kinderh. **42**:248 (Nov.) 1926.

The figures given in table 2 while small in number tend to support the fact that there may be a depression in skin response to scarlet fever toxin during the acute febrile stage of certain diseases.

In a number of patients we examined the site of injection of the scarlet fever toxin for several days. In some of these an erythema appeared long after the time at which a Dick test is usually read. This is shown in table 3.

We are not prepared to explain this delay in reaction. We [8] noted this delay also in the case of the tuberculin reaction.

TABLE 2.—*Dick Tests Prior to and During the Acute Febrile Stage of Diseases*

Diseases	Number of Cases	Prior to Disease		Febrile Stage	
		Number Positive	Per Cent Positive	Number Positive	Per Cent Positive
Measles	10	3	..	1	..
Diphtheria	13	3	..	2	..
Varicella	14	5	..	2	..
Pertussis	7	5	..	2	..
Miscellaneous	1	1	..	1	..
Total	45	17	38	8	18

TABLE 3.—*Delayed Appearance of the Dick Test*

Number of Cases	Day Reaction Occurred
20	2
2	3
6	4
2	5
1	8
Total 31	

OBSERVATIONS ON THE DICK TEST IN SCARLET FEVER

The present paper is primarily for the purpose of discussing the effect of diseases other than scarlet fever on the Dick reaction. Certain other observations may, however, be recorded here.

The skin reaction obtained by the intracutaneous injection of a heat-killed suspension of scarlet fever streptococci in 0.85 per cent solution of sodium chloride to which 0.5 per cent phenol had been added was compared to that obtained from diluted scarlet fever toxin.[9] The reactions were the same in 124 or 92.5 per cent of 134 patients who had positive

8. Eddy, Bernice, and Mitchell, A. G.: Studies in Immunity: II. The Effect on the Skin Tuberculin Reaction of Nonspecific Factors, Am. J. Dis. Child. **40**:771 (Oct.) 1930.

9. The streptococci were from cultures kindly sent by the Dicks.

reactions to one or both. In 5 patients the toxin caused a positive reaction when the vaccine did not, and in 5 the vaccine caused a reaction when the toxin did not.

It is hardly our function in this publication to review the literature which contains instances of persons developing scarlet fever who have had negative Dick tests. We have seen this happen in the case of attendants on contagious wards. We had the opportunity to perform Dick tests within six months on 19 children who were afterward admitted to the hospital suffering from scarlet fever. Five of the 19 had had negative tests, the other 14 being positive.

On 546 patients with scarlet fever, we performed Dick tests at various times during the acute febrile stage and during convalescence. The results were puzzling, as 4 groups were encountered as follows: (1) that group in which a positive test became negative about the third to the seventh day of the disease and remained negative thereafter; (2) that in which a positive reaction remained so throughout the acute course of the disease and for as long as five weeks after its onset; (3) that in which the reaction was negative early in the disease and remained so throughout convalescence, and (4) that in which the reaction was positive at the beginning of the disease, became negative about the seventh to the tenth day, but again became positive during convalescence. (Of 147 patients tested thirty-one days or longer after the onset of scarlet fever, 27 per cent were found to have positive reactions.) There apparently was no relation of these variations to the incidence of complications or to any other discoverable factor, and we are inclined to feel that faulty technic was not responsible. Again we forbear to quote the literature extensively, but it may be mentioned that Abramson,[10] in studying 182 patients, found much the same type of variation in the Dick test during scarlet fever that we did. The number of positive Dick tests in persons who have had scarlet fever varies, according to the reports in the literature, from 9.3 to 48 per cent.

SUMMARY

Apparently, certain diseases occasionally cause a positive Dick test to become negative during their acute febrile stages. This does not occur regularly, and the evidence so far accumulated in the literature indicates that measles is especially apt to cause this depression of skin response to scarlet fever toxin.

There may be a delay in skin response to injections of scarlet fever toxin so that erythema occurs at the site later than twenty-four hours after its injection. Whether this is a pseudoreaction or just what it signifies, we are not prepared to state.

10. Abramson, L.: Acta pædiat. **7**:138 (Nov.) 1927.

The skin response to a heat-killed suspension of scarlet fever streptococci was similar to that obtained to scarlet fever toxin in about 90 per cent of the patients.

Great variation, which was probably not due to errors of technic in injecting, was encountered in the skin response to scarlet fever toxin in the acute and convalescent stages of scarlet fever. Some patients had positive tests throughout the entire course of the disease and some had negative ones; others had tests which varied from positive to negative or negative to positive. About 30 per cent of the patients had positive tests thirty-one days or longer after the onset of scarlet fever.

MILK SUGAR IN INFANT FEEDING

A STUDY OF THE EFFECTS OF THE ROUTINE USE OF MILK SUGAR IN INFANT FEEDING *

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The object in this investigation was to observe the effects of the routine use of milk sugar (lactose) in infant feeding, approved methods being used for giving the other elements of the formulas the maximum digestibility.

The routine use of any given type of modified infant feeding has led to a kind of "faith dispute" among physicians. This is probably due to the fact that expert work with a given method always yields commendable results. Such results tend to confirm the belief of the general practitioner that there is no panacea in infant feeding. What he wants is a simple method for the average case.

The literature on infant feeding contains many opinions of the advantages of this or that sugar, but most of them lack any scientific proof of the conclusions drawn. These, combined with timely commercial propaganda, have given rise to a vast array of sugar preparations, for each of which unsurpassable advantages are claimed. As one result, the use of lactose in modified infant feeding has diminished. Many pediatricians dispute the identity of lactose of other mammalian milks with that of human milk. Others imply that lactose is no more meant for the infant than is cow's milk. These observers overlook, however, the chemical fact that regardless of the kind of mammal, lactose occurs in the milk of all. The statement "lactose is animal sugar and is meant for animal development" stands as a fact. Prior to the twentieth century, disturbances of nutrition giving rise to gastro-intestinal upsets were attributed to lactose per se, and some workers conducted clinical experiments from which it was concluded that lactose is a toxic substance. Apprehension at once arose regarding its use, and in a measure has not as yet been dispelled. Today it is known that many of its alleged evils are due to diminished digestibility of the other ingredients of the formulas, to say nothing of the large part played by actual infection within or without the gastro-intestinal tract proper. Hence, no attempt

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* From the Department of Pediatrics, New York Post Graduate Hospital and Medical School.

will be made to summarize the literature on this subject prior to the last two decades, and reference will be made only to work within this last period that seems scientifically pertinent.

While carbohydrates have a more or less uniform caloric value, their availability in metabolism varies greatly. Chapin,[1] in 1912, showed the fallacy of assuming that the best available sugar is of the greatest value to the infant's metabolism, that the energy expended in storing carbohydrate as glycogen in excess of body requirement detracts correspondingly from growth energy, and that excess water is bound in the tissues. This is not true in the case of milk sugar, as its slower rate of absorption precludes excessive glycogen formation. Weight for weight, infants fed on milk sugar possess correspondingly more living tissue than when an excess storage of glycogen exists as in the case of infants fed on vegetable sugar. Lactose, therefore, should be the sugar of choice for normal infants, as its digestion and assimilation occur more slowly than with vegetable carbohydrates and its molecule yields only one molecule of available dextrose. Talbot and Hill,[2] in 1914, showed that lactose facilitates assimilation of nitrogen within certain limits when administered in increasing amounts. Thierfelder,[3] in 1914, Mathews,[4] in 1921, and Kimmelstiel,[5] in 1929, identified and correlated lactose and galactose with cerebrosides and brain tissue and showed the rapid development of the brain tissue during the period of artificial feeding, indicating an ever increasing need for a source of galactose during this period.

Bergeim,[6] in 1926, demonstrated that lactose facilitated calcium and phosphorus absorption markedly as compared with any other sugar. This work has been confirmed by Killian, whose paper is to be published shortly. In 1928, Steuber and Seifert[7] demonstrated that the infant is unable to transform lactose into fat and cannot substitute it biologically. Therefore, illusions about growth and development in the form of fat storage will not exist when this sugar is used.

1. Chapin, H. D.: The Properties, Uses and Indications of Various Carbohydrates Used in Infant Feeding, J. A. M. A. **59**:2221 (Dec. 21) 1912.

2. Talbot and Hill: Influence of Lactose on Metabolism of Infants, Am. J. Dis. Child. **8**:218 (Sept.) 1914.

3. Thierfelder, H.: Ztschr. f. physiol. Chem. **85**:35, 1913; **89**:248, 1914; **91**: 107, 1914.

4. Mathews, A. P.: Textbook of Physiological Chemistry, ed. 3, New York, William Wood & Company, 1921, pp. 56 and 310.

5. Kimmelstiel, P.: Biochem. Ztschr. **212**:359, 1929; Chem. Abstr. **24**:386, 1930.

6. Bergeim, C.: J. Biol. Chem. **62**:45 and 49, 1924-1925; **70**:29, 1926.

7. Steuber and Seifert: Arch. f. Kinderh. **85**:12, 1928.

In 1928, Gerstley, Wang, Boyden and Wood [8] showed that the stool of a breast-fed infant is rather constant regarding weight, volatile acid output and total titratable acidity, and that it varies in the infant fed on cow's milk. They [9] also demonstrated that excess lactose feeding to the breast-fed infant causes little change in the feces while in the infant fed on cow's milk an increase of free acid occurs, and the frequency and weight of the stools are affected. When the lactose was increased to 12 per cent, the relationship existing between total titratable acidity and total volatile acidity approached that observed in the breast-fed infant. No alimentary disturbance resulted from excess lactose feeding. When an intercurrent parenteral infection took place, it was a potent agent in producing a tremendous increase in weight and acidity of stools which lasted for weeks after clinical symptoms had disappeared. Furthermore, although the same dosage of lactose was continued, no increase of symptoms and no changes in the stools were noted. These authors concluded that intestinal fermentation is not a primary dietary disturbance. Randoin and Lecoq [10] and L. Knudson [11] showed that neither lactose nor galactose is toxic to the animal organism, but that galactose must be assimilated in a strict equilibrium with dextrose, i. e., in the relationship existing in lactose during digestion and assimilation.

EXPERIMENTAL WORK

Killian,[12] who collaborated with me in this investigation, but who will report separately in the near future, studied the effect of lactose as the only carbohydrate of the diet on the composition of the soft tissues of the bodies of rats:

Thirty-six albino rats of known ancestry, twenty-eight days after birth, were weaned and divided into three groups of twelve each. McCollum's control diet was used for one group; the remaining two groups were given diets containing only sucrose and lactose, respectively, as the source of exogenous carbohydrate. All diets were maintained over a period of sixty days, and weights were determined every seven days. McCollum's diet being adopted as the standard for

8. Gerstley, J. R.; Wang, C. C.; Boyden, R. E., and Wood, A. A.: Influence of Feeding on Certain Acids in Feces of Infants, Am. J. Dis. Child. **36**:289 (Aug.) 1928.

9. Gerstley, J. R.; Wang, C. C.; Boyden, R. E., and Wood, A. A.: Influence of Feeding on Certain Acids in Feces of Infants, Am. J. Dis. Child. **35**:580 (April) 1928.

10. Randoin, L., and Lecoq: Compt. rend. Acad. d. sc. **184**:1347, 1927; **185**: 1068, 1927; **189**:1188, 1929.

11. Knudson, L.: Ann. Missouri Bot. Garden **2**:659, 1915.

12. Killian, John A.: A Study of the Effects of Lactose Feeding, as the Only Source of Carbohydrate in the Diet of Rats, upon the Composition of the Soft Tissues, to be published.

comparison of weight curves the sucrose-fed rats averaged 11 per cent above the control curve, while the lactose-fed rats averaged 5 per cent below the control curve and 16 per cent below the sucrose curve. Six rats from each group were ashed in toto, after which the following determinations were made: The ash was 3.73 per cent of the body weight in the control rats, 3.27 per cent in those fed sucrose and 3.87 per cent in those fed lactose. It is evident that the greater weight of the sucrose-fed rats is not due to mineral salt content. It is also evident that lactose facilitates the absorption of mineral salts, as has been previously mentioned in reference to Bergeim and Killian—the fixation of calcium and phosphorus.

The tissue of the remaining six rats of each group were removed, desiccated to a constant weight and analyzed, with the following results:

	Control Rats, Gm.	Rats Fed Sucrose, Gm.	Rats Fed Lactose, Gm.
Water	72.0	78.1	70.7
Total solids	28.0	22.9	29.3
Protein	18.3	14.7	19.1
Ether extract (Lipoids)	3.5	3.7	2.8
Ash	5.2	4.2	5.9
Glycogen	0.17	0.29	0.24

The very significant observations were the greater amount of total solids (i. e., less water) in the tissues of the lactose-fed rats. It is also noteworthy that the lipin content of lactose-fed rats is less than that of either the control or sucrose-fed rats. The lower water content of the lactose-fed rats is partially due to the lower glycogen and lipoid content of their tissues and also probably due to the slight diuretic and laxative action of the lactose per se. However, of greatest importance is the fact that more living tissue is present in the lactose-fed rat than in either the control or the sucrose-fed rat, weight for weight.

I used lactose for longer or shorter periods in over 1,000 consecutive cases and observed 100 cases critically over a two year period of routine feeding with modified formulas containing lactose, in order to determine the tolerance of the infant to lactose during both the winter and the summer months and to note any clinical values of this type of feeding. Routine formulas were composed of whole cow's milk, water and lactose. Careful attention was given to adequate vitamin prophylaxis. Specified amounts of milk, water and lactose were mixed together cold and boiled for three minutes, stirring continuously, thereby rendering the protein and fat more available for digestion. Cereals and vegetables were added between the ages of 5 and 8 months depending on development and dentition, and all cases were observed weekly. Ten grams of lactose were first added and increased by an equal amount every third day to percentages varying between 5 and 9, depending on the clinical progress and indications. During the first few days following the beginning of lactose administration slight tympanitis was frequently noted when the sugar had been of vegetable origin previously. This, however, subsided with the appearance of normal stools. The cases observed were average and not selected; the periods of observation included failures to gain or actual losses of weight due to intercurrent infections as they appeared.

This group comprised sixty-four infants under 6 months of age, including five immature infants (table 1) and ten malnourished infants, and thirty-six infants over 6 months. The progress of the immature and malnourished infants is shown in table 2. The average age at the beginning of the experiment was 2½ months for the infants under 6 months of age; their average weight was 10¾ pounds (4.8 Kg.) and average birth weight 7¾ pounds (3.5 Kg.). The average time of the experiment was 13¾ weeks, and the average gain per week 5¼ ounces (163 Gm.). The average weight of the infants over 6 months of age was 15 pounds (6.7 Kg.) at the beginning of the experiment. Their average birth weight was 7½ pounds (3.3 Kg.). The average gain was 4½ ounces (127 Gm.) per week, and the average time of the experiment was 14¼ weeks.

TABLE 1.—*Weekly Gain in Weight in Immature Infants*

Age at Start, Months	Birth Weight		Weight at Start		Weekly Gains, Ounces	Time, Weeks
	Pounds	Ounces	Pounds	Ounces		
1	6	..	5	7	4	21
2	4	4	7	11	10½	14
2	4	8	6	11	6¾	17
2	7	1	6	13	6½	24
2	6	4	6	11	5½	24

TABLE 2.—*Weekly Gain in Weight in Cases of Malnutrition*

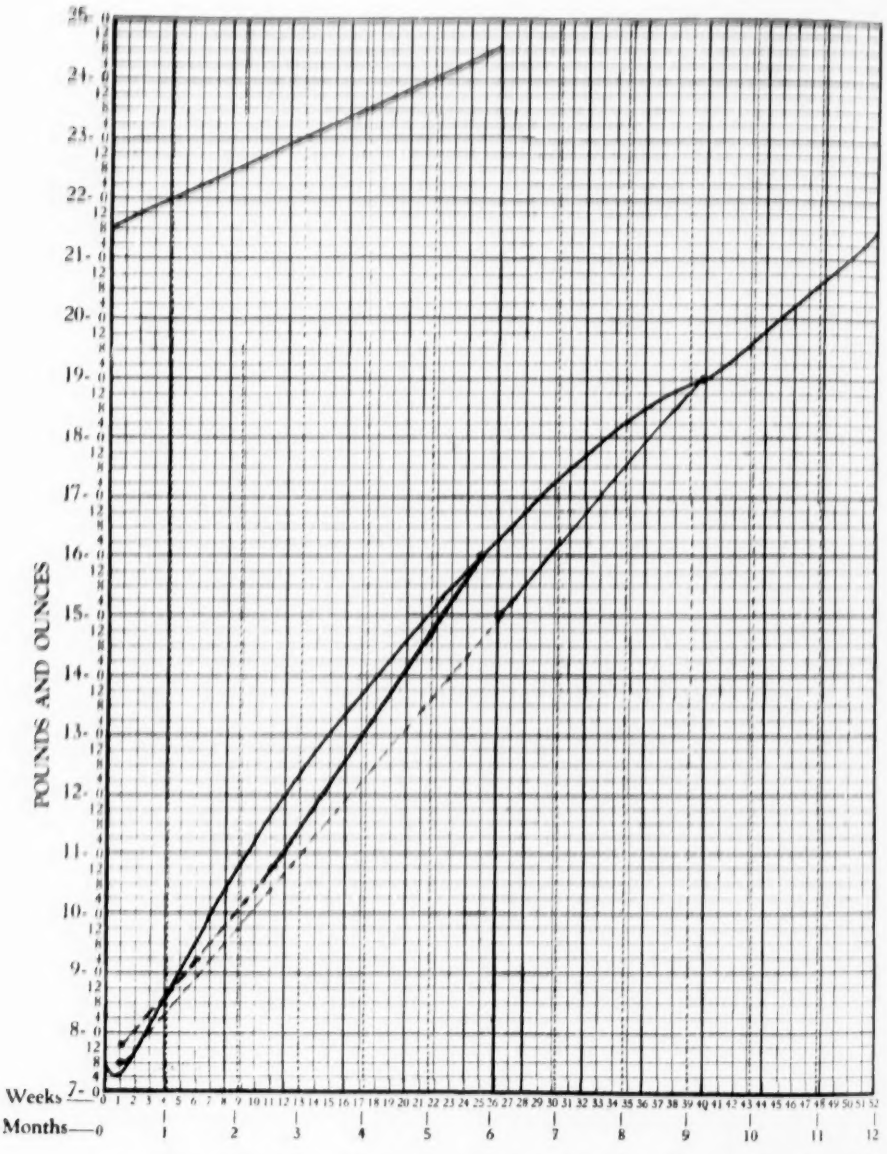
Age at Start, Months	Birth Weight		Weight at Start		Weekly Gains, Ounces	Time, Weeks
	Pounds	Ounces	Pounds	Ounces		
1	8	8	8	..	6	19
1	8	14	9	15	5	6
1½	6	8	7	6	6¼	18
1½	7	..	8	14	5½	20
1½	12	..	10	9	9¼	19
2	8	5	9	5	5	18
2	8	..	7	3	5	13
3	9	..	10	9	12	14
4	8	8	8	11	4½	9
4½	10	..	13	12	5¼	12

RESULTS

1. No intolerance toward lactose was noted in clinical manifestations. In no instance was a given percentage of lactose reduced. It is interesting to note that over 1,000 infants received lactose, inclusive of complementary and supplementary formulas, without evidence of intolerance.

2. Gains in weight varied, but averaged the amount previously noted. So many factors affect the growth impetus, such as environment, prenatal health of the mother, heredity, etc., that little need be said but that the average environment was poor, most of these children coming from New York's tenement districts.

3. The tissues of these children seemed more firm than that of the average infant receiving vegetable sugar and resembled that of the breast-fed infant. Fat babies were rarely observed.



The upper curve shows the gain in weight of sixty-four infants under 6 months of age. The average age at the beginning of the investigation was 2½ months; the average birth weight, 7¾ pounds; the average weight at the start, 10¾ pounds, and the average gain, 5¾ ounces a week for thirteen and three-fourths weeks. The lower curves show the gain in weight of thirty-six infants over 6 months of age. The average age at the start was 6 months; the average birth weight, 7½ pounds; the average weight at the start, 15 pounds, and the average gain, 4¼ ounces a week for fourteen weeks.

4. These children, with rare exceptions, did not lose weight during the course of an intercurrent infection, but simply failed to gain properly. No clinical dehydration developed even in the presence of parenteral gastro-intestinal upsets with acidosis.

5. No protracted nutritional disturbances developed.

6. There was no complaint of habitual anorexia by the mother.

7. There was no complaint of habitual constipation. The average number of stools varied from one to two per day.

8. No infantile eczemas developed.

9. The general nervous and mental status was placid.

10. When lactose was used in complementary and supplementary diet, both breast and bottle feedings were taken well on the average throughout the period of infant feeding.

CONCLUSIONS

I urge a more common use of lactose in infant feeding, based on the following observations:

1. Lactose is well tolerated by the infant when the other elements of formulas are rendered more available for digestion; and it may be increased to amounts of the eventual formula in 10 Gm. doses (i. e., 1 level tablespoon) at three-day intervals with safety.

2. Boiling and stirring the formula for three minutes renders the protein and fat of cow's milk more available for digestion by making it a more favorable medium for the administration of lactose than unboiled milk.

3. The lactose-fed infant resembles but does not equal the breast-fed infant in firmness of tissues and resistance toward infections.

4. The danger of sudden dehydration with acidosis in the presence of parenteral infection is less acute in lactose-fed infants than, as is well known, in infants fed on vegetable sugar. This is probably due to tissues of less water content normally.

5. Age-weight for age-weight, the lactose-fed infant possesses more living tissue than does the infant fed on vegetable sugar. This is due to the lower water content as well as to the lower fat content of the tissues of the infant fed on milk sugar.

. Lactose formulas facilitate complementary and supplementary feedings with less danger of refusal by either the breast-fed or bottle-fed infant.

7. Lactose formulas lessen the dangers of the development of habitual anorexia or constipation.

8. As a source of galactose for the development of the central nervous system, lactose is especially desirable as a sugar for modified feeding in an optimal amount.

MENTAL AND PHYSICAL DEVELOPMENT OF CHILDREN PREMATURELY BORN

PRELIMINARY REPORT ON MENTAL DEVELOPMENT *

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Psychologic study of prematurely born children is scantily and inadequately reported, and widely conflicting statements are found. It is not our purpose to review the literature at this time, but an illustrative quotation from an extensive study of 437 premature or immature children will not be amiss.

> The fate of immature children is not enviable; almost one-half of them die during the first year of life. Of those that remain alive, the majority are physically as well as mentally underdeveloped. Some of them show a late mental development; others show a condition of psychic infantilism, if the term may be used in its nonspecific sense; while still others show permanent and severe mental diseases. When they are passed in review, one is surprised at the variety and amount of abnormality encountered, almost a regular "pathologic museum." In brief, the immature infant becomes the backward school child, and is a potential psychopathic or neuropathic patient and even a potential candidate for the home for imbeciles and idiots.[1]

In contrast with this statement is the conclusion that physical and mental injuries resulting from prematurity, which remain through life, are not observed, that such divergences as delay in walking are due to lack of muscular tone rather than to mental injury, and that the mentality of the children observed was of the "highest type in every par-

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* Read before the Eighth Annual Meeting of the American Orthopsychiatric Association, New York, Feb. 21, 1930.

* This study, undertaken at the suggestion of Dr. Julius H. Hess, was made possible by cooperation of the clinic for prematurely born children, Sarah Morris Hospital for Children of the Michael Reese Hospital, Chicago, and the Behavior Research Fund, Illinois Institute for Juvenile Research.

* For mortality statistics and physical data on the group of prematurely born children of the Sarah Morris Clinic, see Hess, Julius H.; Chamberlain, I. McKy; and Lundeen, Evelyn, C.: Premature Infants: A Report of Seven Hundred and Sixty-One Consecutive Cases, Pennsylvania M. J. **33**:429 (April) 1930.

1. Capper, Aaron: The Fate and Development of the Immature and of the Premature Child, Am. J. Dis. Child. **35**:443 (March) 1928.

ticular."[2] Other observers give data tending to minimize the ultimate effect of prematurity, and disagree with Ylppö's dictum that "rein volkwirtschaftlich und rassenhygienisch erweist sich die Aufzucht von kleinen und kleinsten Frühgeburten nicht wünschenwert" (from the point of view of social economics and of race hygiene, the raising of small and weak premature infants is not advisable).[3]

Many factors complicate any attempt to evaluate the effect of premature birth on subsequent growth and development. It is demonstrated that prematurely born children develop anemia, difficult or impossible to overcome for some months, doubtless attributable to immaturity of the hematopoietic organs. A vasolability, attributable to persistence of a fetal state of the capillaries and incomplete development of the vascular elastic tissue is said to be responsible for frequent occurrence of hemorrhages. It is obvious that many physical divergences from the structure of the infant born at full term require specific evaluation, which can be only partially attempted in this report. For the present, we must note the contention[4] that the physical growth of the prematurely born infant conforms to rules of growth which pertain to postconceptional age. It is said that the birth process occasions no disturbance in growth if a certain stage of completion of the organism has been reached; this stage is rarely reached before the twenty-eighth week of life. In a healthy prematurely born infant there is no difference between intra-uterine and extra-uterine growth for a given postconceptional month. Of course, a physiologic loss of weight, corresponding to that of the normal new-born infant, is also observed in prematurely born children.

GROUP OF CHILDREN STUDIED

Mental growth curves for the healthy normal infant are scant. Our present report attempts an initial orientation by study of one hundred and thirteen white infants and children, prematurely born, whose birth weights were 2,500 Gm. or less. Comparison is made with forty of their siblings. These children were available through the clinic for prematurely born children conducted by the Sarah Morris Hospital for Children, Michael Reese Hospital, Chicago. The Sarah Morris Hospital offers unusual facilities for care of premature infants, being well equipped with incubators, rooms properly heated and ventilated

2. Comberg, Maria: The Fate and Development of Premature Infants up to Early School Age, Ztschr. f. Kinderh. **13**:463 (May) 1927; abstr., Am. J. Dis. Child. **36**:905 (May) 1928.

3. Brandt, Paul: Das Schicksal der Frühgeburten, Monatschr. f. Kinderh. **37**:501, 1923.

4. Reiche, A.: Das Wachstum der Frühgeburten in den ersten Lebensmonaten, Ztschr. f. Kinderh. **12**:363, 1915; **13**:332, 1916.

with a view to their special needs, nurses specially trained in the care of premature infants and a staff of wet nurses. After the children are discharged from the hospital, they return to the special infant welfare clinic, where the same staff supervises their later care for a period of at least two years. The present study was carried out at this infant welfare clinic.

The prematurely born group included fifty-one boys and sixty-two girls, whose chronological ages varied from 8 months to 7 years at the time of examination, with a mean chronological age of 2 years and 9 months. The forty siblings ranged in aged from 6 months to 12 years and 5 months, with a mean chronological age of 5 years and 8 months. Birth weights of the prematurely born ranged from 907 to 2,500 Gm. (mean, 1921.681 ± 23.461 Gm.; standard deviation, 369.757 ± 16.591).

TABLE 1.—*Racial Composition of Children*

Parents	Number of Premature Children
Russian or Polish Jews	33
Anglo-Saxon	26
Irish	11
German	10
Slavish Polish	7
American	6
Italian	6
German (mixed)	5
Italian or French	4
Polish	3
Greek	1
Swedish	1
	113

The prematurely born group included seventeen sets of twins and the surviving member of seven twin births.

The racial composition of these children is indicated by the national origin of their parents:

The great majority of the families were of the lower middle economic level, largely with marginal incomes. A few of the children were gleaned from the private patients of the physicians associated with the clinic, and represent an economically superior group.

It was deemed advisable to undertake an initial estimate of the developmental and intelligence levels of such children as were available for testing through the clinic. In view of the youth of the children, together with the paucity of standardized tests for infants and very young children, many difficulties were encountered. Our present study confines itself strictly to a statement of what these children do on certain tests, a comparison of their performance with that of their siblings on similar tests (so far as such a comparison can be made), together with an effort to estimate the relation of certain factors incidental to prematurity (such as birth injuries) to our observations.

GESELL TESTS

All children were tested on the Kuhlmann-Binet scale. In addition, all children 5 years of age and under were subjected to the Gesell test items[5] to determine the developmental level according to these schedules. Initially the Merrill Palmer tests were also given. However, because of the impracticability of giving both this series and the Gesell schedules, the latter were selected on the basis of a wider age range, extending down into the age groups that are especially pertinent to this study. We have recorded, then, the performance of the children on one or two schedules, together with complete medical and physical data. All psychologic tests were given by the same examiner (P. B.).

Gesell ratings were obtained for 107 children. For our purposes, the performance was classified as average, less than average or above average. The criteria determining placement of the given child in a given group are less objective than those that determine the rating on

TABLE 2.—*Distribution of Ratings of One Hundred and Seven Prematurely Born Children According to Classification on Gesell Developmental Schedules*

Rating	Number	Per Cent
Average	46	43
Below average	37	35
Above average	24	22
	107	100

the Sanford-Binet scale according to which fixed values can be assigned to given performance. The ratings combine experience with, and knowledge of, infants on the part of the individual examiner with the quality of performance as denoted by the assigned letter ratings[6] and by the proportion of successes and failures on the test items in the appropriate series level. Postnatal age corrected for the period of prematurity was used as the basis in estimating the performance on the Gesell schedules. This is of minor importance in the older children but of great significance with the younger infants. Children could not be tested at ages corresponding exactly with the age levels for the Gesell schedules. The performance at the nearest level above or below the chronological age, or both, was utilized as the basis of estimate.

The distribution of the ratings according to the Gesell schedules is presented in table 2.

It is not felt that more definite qualification of the degree of "above" and "below" average is justified on the basis of the present status of the available tests, although extremes, both superior and inferior, are

5. Gesell, Arnold: The Mental Growth of the Pre-School Child, New York, The Macmillan Company, 1925, pp. 362-384.

6. Gesell, Arnold: The Mental Growth of the Pre-School Child, p. 362.

readily discernible. The percentages would indicate a general performance on the Gesell developmental schedules slightly below average. Plotting of a tentative division of the performances into five rather than three classes bore out a tendency to skewing toward the lower values of the frequency curve, but the validity of this finer division is as yet open to question.

Inspection of the chronological ages of the children in the three groups reveals the values given in table 3.

It is apparent from this table that the younger children tend to fall into the superior group, and the older ones into the duller group. In view of the relatively small numbers of children involved, this may be due to chance selection, but the greater likelihood is that such an observation is based on faulty age placement in some of the tests. These possibilities will receive attention later.

TABLE 3.—*Mean Chronological Age of One Hundred and Seven Prematurely Born Children Classified According to Performance on Gesell Developmental Schedules*

	Below Average		Average		Above Average	
	Number		Number		Number	
Mean chronological age	37	38.486±2.664	46	28.533±1.226	24	22.000±1.00
Standard deviation		18.610±1.466		12.537±0.867		11.651±1.13
Mean chronological age (corrected for prematurity)		37.081±2.636		27.623±1.231		20.375±1.00
Standard deviation		18.275±1.433		12.275±0.863		11.425±1.11

An effort was made to throw some light on the character of the performance of these children by determining the relative "values" of the ratings in the different fields (motor, language, adaptive, personal-social) at various age levels. The relative excellence of the performance in each of the given fields as compared with the performances by the given child in the other three fields was noted. Such a comparison indicates that in the so-called field of personal-social behavior, the performance of these children is consistently relatively high. This may be a result of the unusual care and attention they are given, and therefore a result of training. These children have had an additional period of extra-uterine experience, and therefore additional opportunity for training.[7] We do not know whether full term children would show similar relationships of performances in the various fields.

In motor performances the children are relatively poor. At the 48 month level, there appears to be an exception. Inspection of the motor tests indicates that those given at the 48 month level are easier for the children of that age than are the corresponding tests at 36

7. Gesell, Arnold: Infancy and Human Growth, New York, The Macmillan Company, 1928, p. 320.

months for the children aged 3. It is our impression that a similar consideration holds for language performance. The 30 month performances are relatively much easier than the 24 month performances.

The prematurely born children were divided into two groups, those weighing less than 2,000 Gm. at birth and those with a birth weight of 2,000 Gm. or more. The children in these two classifications were then compared on the basis of their Gesell ratings.

The children who do better on these tests tend to be among those who are heavier at birth.

The performance of seventy children under 33 months of age was analyzed with respect to actual failures and successes on individual developmental items at their corresponding age levels. The items included at each of these levels were those selected by Gesell "as (constituting) normative summaries for each of the developmental levels." Gesell warns us "it is clear . . . that they cannot be scored on a

TABLE 4.—*Rating on Gesell Developmental Schedules of Infants Weighing Below 2,000 Gm., and 2,000 Gm. or Above, at Birth*

	Below Average		Average		Above Average	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Weighing 2,000 Gm. or above	17	46	19	41	13	54
Weighing less than 2,000 Gm.	20	54	27	59	11	46
Totals	37	100	46	100	24	100

purely plus and minus basis and arithmetically compounded into a psychometric mental age. It must be emphasized that serious use of the schedule, in its present form, presumes a large amount of clinical familiarity with infants of every age." [8]

The performances of only seventy children were considered, as these summaries are given by Gesell up to 30 months of age only. Inspection of performance on each of the individual items indicates that the great majority of these children succeed in the performances suitable to their age corrected for the degree of prematurity. The ratio of successes to failures is 72:28. On account of the nature of the tests, such scoring alone must be considered inadequate but is doubtless of utility as an additional measure, and eventually must be considered in age placement of the individual items.

KUHLMANN-BINET TESTS

Kuhlmann-Binet tests were given to the 113 children examined. It is obvious that intelligence quotients of very young children computed on the Kuhlmann-Binet scale are subject to great error, since very

8. Gesell, Arnold: Infancy and Human Growth, New York, The Macmillan Company, 1928, p. 127.

minor deviation in mental age introduces wide fluctuations in the intelligence quotient. Intelligence quotients uncorrected for prematurity range from 0.60 to 1.44. Forty-nine cases, or 43 per cent of the total, fall within a range of .90 to 1.09. The median intelligence quotient is 1.05. Briefly, about one half of the group are of average intelligence according to this test, four-fifths are average or superior, one-fifth are below average. Three children, ages 11, 17 and 48 months, respectively, are to be classified as mentally defective. When correction is made for prematurity, similar observations obtain, with a tendency to still higher ratings.

A correlation of intelligence quotients on Kuhlmann-Binet tests with chronological age reveals $r = -.3403 \pm .0561$. The negative

TABLE 5.—*Distribution of Intelligence Quotients (Kuhlmann-Binet) of Eighty-Six Prematurely Born Children Over 18 Months of Age*

Intelligence Quotient Range	Intelligence Quotient Computed on: Postnatal Age, Number	Intelligence Quotient Computed on: Age Corrected for Period of Prematurity, Number
60–69	1	1
70–79	5	3
80–89	12	8
90–99	18	15
100–109	25	22
110–119	13	16
120–129	7	12
130–139	4	5
140 and above	1	4
	86	86

correlation obtained is dependent on the fact that high intelligence quotients were obtained on the Kuhlmann-Binet for the younger age levels. A more reliable index is obtained by exclusion of all children younger than 18 months. A frequency curve of intelligence quotients for eighty-six children 18 months of age and above differs from that of the entire group in that many of the higher intelligence quotients drop out. The general nature of the curve is similar.

The distribution is given in table 5.

We are not inclined to regard the results of the Kuhlmann-Binet examinations as offering precise measurements of the intelligence of our group of children, particularly of the younger ones; however, using it for rough purposes of classification, we may note the distribution of intelligence quotients of Kuhlmann-Binet (calculated for age corrected for the period of prematurity) in the three groups classified as average, below and above average, by use of the Gesell developmental schedules.

The correlation between these two sets of tests indicated by the distribution noted is a fairly high one; eleven of the twelve children

obtaining intelligence quotients of less than 90 were classified as below average on the Gesell ratings. Considerable overlapping is noted when intelligence quotients range from 90 to 119. The marked overlapping in higher intelligence quotient ranges is attributable to the fact that these constitute for the most part the very young group in which, as has already been remarked, estimation of intelligence quotient on the Kuhlmann-Binet scale tends to be faulty and too high.

TABLE 6.—*Distribution of Intelligence Quotients (Kuhlmann-Binet) of One Hundred and Seven Prematurely Born Children Classified According to Performance on Gesell Developmental Schedules*

Intelligence Quotient	Classification		
	Below Average	Average	Above Average
60-69	1	0	0
70-79	3	1	0
80-89	7	0	0
90-99	10	4	0
100-109	7	14	2
110-119	7	9	2
120-129	1	7	7
130-139	1	5	3
140 and above	0	6	10
	37	46	24

TABLE 7.—*Mean Chronological Age and Mean Mental Age (on Kuhlmann-Binet Tests) of Prematurely Born Children*

	Total 113 Premature Infants	37 Below Average on Gesell Ratings	46 Average on Gesell Ratings	24 Above Average on Gesell Ratings
Mean chronological age	32.885±1.196	38.450±2.064	28.522±1.226	22.000±1.604
Standard deviation	18.848±0.846	18.619±1.460	12.327±0.867	11.651±1.134
Mean chronological age (corrected for prematurity)	31.372±1.182	37.081±2.026	27.022±1.221	20.375±1.573
Standard deviation	18.623±0.836	18.275±1.433	12.275±0.863	11.423±1.112
Mean mental age	33.330±1.117	34.973±1.953	30.870±1.354	26.875±2.082
Standard deviation	17.610±0.790	17.618±1.381	13.618±0.958	15.129±1.473

Further validity of the separation into the three groupings on the Gesell ratings is indicated by inspection of the relation of mental age to chronological age in the groups (table 7). Here it is noted that the mean mental age for the entire group exceeds the mean chronological age by half a month. The mental age of the "below average" group is 3.5 months less than the chronological age. The mental age of the "average" group exceeds the chronological age by 2.3 months, whereas in the "above average" group, it exceeds the chronological age by 4.9 months. The relationships are similar for the different groups when comparisons are made between mental age and chronological age corrected for degree of prematurity.

COMPARISON OF PREMATURELY BORN CHILDREN WITH SIBLINGS

Forty siblings of the group of prematurely born, ranging in age from 6 months to 12 years and 5 months, serve as a control group. The sibling nearest in age to the premature child was selected in each instance. Only 20 of these children could be subjected to the Gesell schedules as they are an older group than are the prematurely born. Their classification in the three groups on the basis of performance on the Gesell schedules is shown in table 8.

TABLE 8.—*Distribution of Ratings of Twenty Siblings of Prematurely Born Children on Gesell Developmental Schedules*

Classification	Number
Average	13
Below average	5
Above average	2

TABLE 9.—*Data on Performance of Forty Siblings of Prematurely Born Children on Kuhlmann-Binet Test*

Age Range of 40 Siblings—6 Months to 149 Months			
Mean chronological age (months)	68.050±3.885	Standard deviation	36.432±2.747
Mean mental age	69.250±3.786	Standard deviation	35.501±2.677
Range of intelligence quotients	0.63 to 1.27		

TABLE 10.—*Distribution of Intelligence Quotients (Kuhlmann-Binet) of Forty Siblings of Prematurely Born Children*

Intelligence Quotient	Number	Classification	Number	Per Cent
60–69	1	**Below Average**		
70–79	2	(Intelligence quotient below 0.90)	7	17.5
80–89	4			
90–99	9	**Average**		
100–109	8	(Intelligence quotient 0.90-1.09)	17	42.5
110–119	15	**Above Average**		
120–129	1	(Intelligence quotient 1.10-1.29)	16	40
Total	40		40	

The number of siblings included in this group is too small to permit of valid comparison with the prematurely born group. It may be noted however that the full term siblings tend to cluster more about the average rating while a relatively larger number of the prematurely born group are found in the classifications both above and below average.

The siblings were all given the Kuhlmann-Binet tests.

It is to be noted that the mean mental age of this group is 1.2 months greater than the mean chronological age. This difference may be compared with that noted for the prematurely born group, in which the mean mental age exceeded the mean chronological age (corrected for the period of prematurity) by 2 months.

The foregoing data serve to indicate that as a group the siblings do not differ widely from the prematurely born, at least on these tests. A further attempt to compare these children more closely was made. Fifty individual comparisons of prematurely born children with forty individual siblings could be made. This group of prematurely born included nine sets of twins and one family consisting of two nontwin prematurely born children and one full term sibling. For each person involved there are three possibilities: The mental age may exceed, equal or be less than the chronological age. In this respect, too, it may equal, exceed or fail to equal that of the sibling. Siblings are rated as

TABLE 11.—*Comparison of Fifty Prematurely Born Children with Forty of Their Siblings with Respect to Relation of Mental Age to Chronological Age*

Relationship	Number
Premature equals sibling	33
Premature superior to sibling	10
Premature inferior to sibling	7
Total	50

TABLE 12.—*Mean Age in Months at Onset of Dentition, Walking, Speech and Bladder Control of Prematurely Born Children, Their Siblings and Normal Children*

	Total Premature		Premature Below 2,000 Gm.		With Birth Weight 2,000 Gm. and Above		Total Siblings*		Normal Children, Mean Age
	Number	Mean Age	Number	Mean Age	Number	Mean Age	Number	Mean Age	
Dentition	111	8.757	60	9.361	51	7.980	81	7.516	6.9
Walking (unsupported)	100	16.240	54	16.704	46	15.696	81	14.555	16*
Speech (words)	106	14.897	57	15.035	49	14.694	30	15.233	18 girls* 19 boys*
Bladder control	65	22.292	37	23.243	28	21.036	27	20.650	...

* Abt, Isaac A.; Adler, Herman M., and Bartelme, Phyllis: The Relationship Between the Onset of Speech and Intelligence, J. A. M. A. **93**:1351 (Nov. 2) 1929.

"equal" if with both the mental age equals, exceeds or falls below the chronological age. If P represents prematurely born, S sibling, zero "no difference between chronological age and mental age," + "mental age exceeds chronological age," and — "mental age is less than chronological age," the combinations we noted were as follows:

1. P+ and S+
2. P— and S—
3. P+ and S—
4. P— and S+
4. P+ and S_0
6. P— and S_0

Such a comparison indicates that there is no marked difference in the mental development of children born prematurely (when allowance is made for the period of prematurity) and that of their siblings. It is probably a more valid comparison than any based on utilization of

the intelligence quotient, since it is dependent directly on the statement, "this child's performance is or is not that expected at his age," with no attempt to measure the degree of divergence from the norm.

Data relative to the time of eruption of teeth, development of static functions, development of bladder control, have been assembled for our groups of prematurely born and full term siblings.

Statistics as to the normal age of eruption of teeth indicate a rather wide range, from 6 to 9 months. Such data as are available would indicate that our group of prematurely born children are not delayed in eruption of teeth. They walk at a chronological age a little older than their siblings. Since the prematurely born average a gestation period of 7.7 lunar months, this difference closely corresponds with the degree of retardation in walking when compared with siblings. They are not delayed, then, if correction is made for the period of prematurity. Similar considerations pertain to the age of onset of talking. With great regularity our figures relative to the onset of talking indicate a more precocious age than might be expected from other statistics available to us. They are fairly consistent, however, with the age of talking as reported for the siblings, but nevertheless indicate slight precocity of the onset of talking for the prematurely born. The most valid data were obtained on fifty-six children between the ages of 6 months and 30 months, who were tested on the Gesell items. Of these children, every one with a chronological age of 15 months or over talked, at least to the extent of using one word. Seven children under 15 months of age did not talk. Two children under 15 months of age said one word, and six under 15 months of age said more than one word. In addition to this group, one child 48 months of age with an intelligence quotient of 0.66 and evidencing glandular dystrophy did not talk.

We have not had an opportunity to make a detailed comparative study of the performance of twins in our material. Seventeen pairs of twins and seven surviving members of twin birth are included. In the classification of the children in the three categories—average, below and above average—by use of the Gesell development schedules, six pairs of twins fell into dissimilar classes. In all six instances one member fell into the average grouping, four of the remaining twins were in the superior and two in the inferior grouping. There was no relationship between this discrepancy and difference in birth weight of the twins; in three instances the superior infant weighed more than the twin at birth, and in three instances it weighed less. The Kuhlmann-Binet tests indicated appreciable differences in five instances: these were three pairs of twins not selected as differing on the Gesell schedules; another pair of twins differed on the Gesell rating. In one instance

the twins had not been given the Gesell schedules because they were 7 years of age (one of these children was of borderline defective intelligence, the other dull normal).

INFLUENCE OF PHYSICAL FACTORS ON MENTAL DEVELOPMENT

Study of the physical development of the prematurely born children is not within the scope of the present report. However, there are some physical factors that cannot be overlooked in an attempt to evaluate the effect of prematurity on mental growth and development. Many prematurely born children die early, and various physical disturbances are known to be of frequent occurrence among them. Tendency to intracranial hemorrhage at birth, with later attendant neurologic disturbances, tendency to rachitis and anemia were mentioned at the beginning of this report. Without any attempt at complete presentation of physical data, the relationship of some of the physical disturbances to mental development may be inspected.

TABLE 13.—*Ratings on Psychologic Tests of Twenty-Eight Prematurely Born Children Evidencing Early Intracranial Injury*

Test	Classification	Number	Per Cent
Gesell developmental schedules	Average	10	35.7
	Below average	8	28.6
	Above average	0	0.0
Kuhlmann Binet Test	Average	1	3.6

In twenty-eight cases, cyanosis at birth, convulsions or other observations or symptoms indicated the possibility of intracranial hemorrhage or other injury of the central nervous system at birth. Examination of these children during the present study revealed the following:

No evidence of neurologic injury or deviation, 15
- Syphilitic and mentally retarded, 1
- A heart condition, 1
- Delay in teething, 1

Some disturbances in reflexes, 7
- Evidence of glandular dystrophy and mentally retarded, 1
- Evidence of megacephalus, 1

Evidence of strabismus, 2

Megacephalic (chronological ages 10 and 14 months), 2

- Marked delay in development of static functions, 1

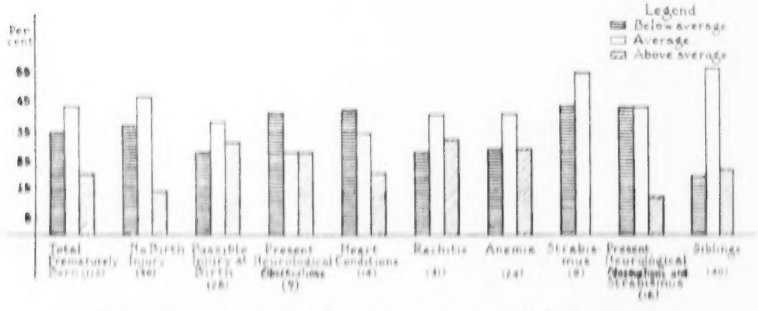
General hypotonus, 1

Hydrocephalus (secondary to hemorrhage at birth with organization of scar tissue), 1

The twenty-eight cases with early history or evidence of injury were classified as on the basis of the psychologic tests as shown in table 13. Three of the most markedly retarded children of the entire group were included in the eight "below average" children. The general

distribution into the three classes is not markedly different than that noted for the entire group. Of seven cases with no early history suggestive of hemorrhage or central nervous system injury, two showed exaggerated tendon reflexes; four evidenced spastic conditions, and one showed a positive Babinski sign. Of these seven cases, two were classified as above average, two average and two below average on the Gesell scale, while one was found to be of borderline defective intelligence on the Kuhlmann-Binet test.

Nine cases without history of early injury and with no other neurologic observations gave evidence of some degree of strabismus. All of these patients were beyond the age of "physiologic" strabismus of infancy. Strabismus was a familial characteristic in one instance. None of these nine children were among those classified as above average on the Gesell scale. Four were average, four below average, and one



Relation of physical disturbances to mental development.

average according to the Kuhlmann-Binet test. This group may then be considered somewhat duller than the group as a whole, as there are no superior members according to both the Gesell and the Kuhlmann-Binet tests, but the small number involved renders any conclusions hazardous.

Heart conditions were rather common among the prematurely born group, particularly among the twins. The relation to mental development of these heart conditions, of rachitis and anemia, as well as that of the physical considerations already discussed, is summarized in the chart.

Twelve of the thirty-one cases with rachitic observations are included in groups with an early history of injury or present neurologic observations. Only three of the twenty-four anemic children are not otherwise included in groups showing such history or physical observations.

The children in this group are not markedly rachitic. The observations listed here are those indicating very mild rachitic disturbances. All of the children had been given cod liver oil, so in a large measure any particular tendency to rachitis has been consistently combated. The

children were more anemic, however, than ordinary groups of children, at least during the earlier months of life. These factors will be adequately discussed in subsequent reports on the physical data.

In three groups selected on the basis of physical deviations of one sort or other, the distribution of classifications by tests, into average, above and below average, indicates a variation from the entire group of prematurely born and from the siblings. These are the small groups showing present neurologic observations without early history of injury (seven cases), the heart cases (fourteen) and those showing strabismus exclusively (nine cases), which appear to be somewhat duller than the group as a whole.

CONCLUSIONS

One hundred and thirteen white infants and children, prematurely born, were studied in order to determine whether the mental development of prematurely born children deviated from that of full term children. This group was compared with forty of their full term siblings.

Birth weights for the prematurely born group ranged from 907 Gm. to 2,500 Gm. (mean = 1,921 Gm.). The mean fetal age at the time of birth was 33.33 weeks (7.77 months). Fifty-one boys and sixty-two girls were included. There were seventeen sets of twins and seven surviving members of twin births in the group. The chronological age at the time of examination ranged from 8 months to 7 years (mean age, 2 years and 9 months).

One hundred and seven of the prematurely born children were classified as of average, above average or below average intelligence, according to their performance on the Gesell developmental schedules. The chronological age corrected for the period of prematurity was used as the basis of estimate of performance. All children were similarly classified by utilization of the Kuhlmann-Binet test.

According to the Gesell ratings, 43 per cent of the children were classified as average, 35 per cent as below average and 22 per cent as above average.

In "personal-social" behavior, the performance of the children was consistently relatively superior. This may be attributable to the unusual care and attention offered prematurely born children or to their additional opportunities for social experience. In motor performances the children were relatively poor.

Those children who weighed relatively more at birth tended to do better on these tests.

According to the Kuhlmann-Binet test, approximately two fifths of the children were of average intelligence, two fifths were of superior intelligence, and one fifth were below average intelligence. Three of the children, aged 11 months, 17 months and 48 months, were mentally defective.

Correlation of the intelligence quotient on the Kuhlmann-Binet test with the chronological age is $-.3403 \pm .0561$. The youngest children tended to attain deceptively high intelligence quotients on this test. The Kuhlmann-Binet test in this age group could merely be considered as of value in rough classification, not as precisely measuring "intelligence."

Observations on the Kuhlmann-Binet test tended to confirm the validity of the classification into average, above average and below average groups on the basis of the performance on the Gesell developmental schedules. The discrepancy lies in the direction of higher values on the Kuhlmann-Binet test.

The mean mental age of the forty siblings exceeded their mean chronological age by 1.2 months; the mean mental age of the prematurely born children exceeded the mean chronological age by 2 months. The full term siblings tended to cluster more about the average ratings, while the prematurely born diverged above and below.

A comparison of performances of fifty individual prematurely born children with those of their forty full term siblings, on the basis of the relation of mental age to chronological age in each case, revealed no significant difference in the mental development of the two groups, if due allowance was made for the period of prematurity.

The prematurely born children did not differ from full term children in the time of the beginning of eruption of teeth, in onset of walking, in beginning of talking and in the learning of bladder control, if correction was made for the period of prematurity. The smaller prematurely born children were consistently a little later in these developments, but again the difference was minimized if this correction was made.

In eight of the seventeen pairs of twins, the children fell into different classifications on the tests for mental development. In only two instances were the differences marked. There was no relation between difference in birth weights of the individual twins and their differences in test performances.

Twenty-eight of the one hundred and thirteen prematurely born children were cyanotic, had convulsions, or otherwise gave evidence of possible intracranial hemorrhage or injury of the central nervous system at birth. Twelve of these children showed no noteworthy deviations on present physical examination, five others showed some disturbance of the reflexes, and the remaining eleven presented various observations. Three of the latter were mentally retarded. The general distribution of the twenty-eight cases into the three groups—average, above, and below average—according to Gesell schedules, did not differ from that of the entire group.

Seven children without early history or evidence of hemorrhage or injury of the central nervous system at birth presented physical obser-

vations related to the central nervous system. Of these, four were spastic to some degree. One of the spastic children was of borderline defective intelligence type. This group of seven children, a group of nine children who evidenced strabismus only and fourteen children who presented heart conditions contained fewer of the superior children than groups selected on other bases.

Accurate frequency curves indicating distribution of intelligence among our prematurely born children cannot be made on account of the limitations of the available tests. The indications are, however, that such curves are fairly symmetrical with the larger number of children falling within range of average intelligence.

Hemorrhage and other injury at birth result in consequences to prematurely born children that do not differ from those clinically noted among the children born at full term. If they occur more frequently among the prematurely born, they constitute an extra hazard of prematurity.

THE CARBON DIOXIDE ABSORPTION CURVE OF INFANTS FED LACTIC ACID, HYDROCHLORIC ACID AND BOILED COW'S MILK *

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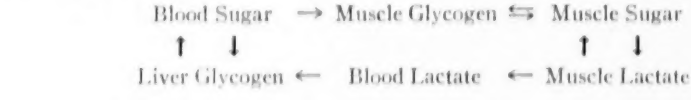
Lactic acid milks of one sort or another have been household remedies for centuries, and have been used critically by physicians for over a generation. Nevertheless, the exact reasons for their beneficial influence are unknown, and objections to their use are raised on theoretical grounds. Although infant feeding has progressed most when guided by observations of results in babies, rather than by attempts at chemical imitations of some preconceived ideal food, it was felt that more information concerning the chemical effects of lactic acid milk on the body is desirable.

The literature on the rôle of lactic acid in physiology is too large and manifold to present here, but it does seem desirable to keep in mind certain facts that are well recognized by physiologists. There are three types of lactic acid: (1) d-lactic acid which occurs as a normal metabolite of the body, and which is especially concerned with muscular contraction; (2) l-lactic acid which is made by certain bacteria, and which is probably not handled by mammalian tissue in the same manner as d-lactic acid and (3) r-lactic acid of ordinary fermentation which is a mixture of equal parts of the optically active forms and is probably metabolized, therefore, in two manners.

The cycle of metabolic changes of d-lactic acid may be represented as follows:



According to this scheme, the restoration of lactate to glycogen is dependent on the liver as well as on the muscles. Oxygen is necessary for this transformation. States of cyanosis and violent exercise are the chief ones during which lactic acid accumulates to any great degree.

Hill and his associates [1] have calculated that with exhausting, rapid exercise from 0.7 to 1.86 Gm. of lactic acid may be formed for each

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1. Hill, A. V.; Long, C. H., and Lupton, H.: Oxygen Debt at the End of Exercise, Proc. Roy. Soc. Med. **97**:84, 1924.

kilogram of body weight, and that this amount disappears in from forty five to ninety minutes. Cori and Cori[2] fed d-lactic acid and sodium d-lactate to rats and noted increases in the liver glycogen which could account for 60 per cent of the lactic acid absorbed. From similar experiments, they concluded that rats could not convert l-lactic acid into liver glycogen and that l-lactic acid was metabolized more slowly than d-lactic acid. This agrees with previous work.[3] Himwich, Koskoff and Nahum[4] likewise thought that in dogs the site of formation of blood lactate is the muscles and the place of disappearance, the liver. One would expect, therefore, that d-lactic acid could be handled readily, and the figures of Hill and his associates indicate that large amounts may be metabolized. However, there may be some difficulty in burning l- and r-lactate.

Tastra[5] obtained a slight reduction in blood carbon dioxide (59 to 51 per cent by volume) by feeding 8 Gm. of lactic acid to a man. The carbon dioxide returned to normal in an hour. Blatherwick and Long[6] found slight reduction in the blood bicarbonate after feeding 550 cc. of whole lactic acid milk to adults in one of several experiments. Bradhy[7] determined the blood lactate concentration after feeding 150 cc. of buttermilk to babies, but failed to note any significant difference in the blood lactate concentration of these infants when compared to that of controls fed sweet milk. These results indicate that there is probably no difficulty in handling r-lactic acid in moderate amounts, although there may be some difficulty with larger amounts.

However, the chief changes in infant metabolism brought about by feeding soured milk as contrasted with sweet milk probably concern the different absorption of salts, especially phosphate and calcium. Klotz[8] added lactic acid in varying amounts to cow's milk and studied the content of nitrogen, fat, chloride, potassium, sodium, calcium, magnesium and phosphate in the urine and stools. As compared with con-

2. Cori, C. F., and Cori, G. T.: Glycogen Formation in the Liver From d- and l-Lactic Acid, J. Biol. Chem. **79**:321, 1928.

3. Abramson, H. A.; Eggleston, M. G., and Eggleston, P.: The Utilization of Intravenous Na r-Lactate, J. Biol. Chem. **75**:763, 1927.

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7. Bradhy, M. B.: Lactate Metabolism in Infants; Its Relation to Lactic Acid Milk, Am. J. Dis. Child. **33**:451 (March) 1927.

8. Klotz, M.: Milchsäure und Säuglingsstoffwechsel, Jahrb. f. Kinderh. **70**:1, 1909.

trols on sweet milk, more of all the salts were retained, except when amounts of lactic acid not obtained in lactic acid milk were given. One small infant developed diarrhea when lactic acid was added to a breast milk feeding, and showed a negative salt balance. However, lactic acid in breast milk may upset gastric and duodenal function owing to the low buffer value of human milk, and lactic acid may aid digestion of cow's milk with its relatively high buffer value. Klotz also found that lactic acid added to skimmed milk affected mineral metabolism in the same manner as buttermilk. In looking over his protocols, one notices that the gains in weight were much better when lactic acid was added to cow's milk than when sweet cow's milk was used. One wonders why he did not follow up the lead that his results suggest.

Lactic acid milk leads to more acid urine and more alkaline stools. Blatherwick and Long[8] showed that lactic acid milk when compared with sweet milk showed the following effects on the urine: decreased p_H, increased titratable acidity, increased phosphate, increased ammonia and no change in the organic acids. The increased acidity is therefore due to increased absorption and excretion of phosphate and not to excretion of lactic acid. Lactic acid apparently increases the retention of nitrogen and salts when added to cow's milk. It would be interesting to know whether lactic acid milk has any appreciable effect on acid-base equilibrium of the blood, as previous observations are clear on that point.

The following observations were made on babies who were as nearly normal as it was possible to find in the hospital wards at the time. Most of these children were recovering from infections of the upper respiratory tract and were gaining in weight. When the babies were not doing well, a note was made of the fact on the tables.

Two observations were made on each infant. In eight instances the observations were made after the feeding was changed from sweet to sour milk or vice versa. In one case, the feeding was changed from whole lactic acid milk to hydrochloric acid milk. A week was allowed to elapse between withdrawing the two samples of blood in order that the change in feeding might have time to bring about any change in equilibrium that might occur.

All samples of blood were withdrawn and preserved under mineral oil. Gas analyses were made with the constant pressure Van Slyke pipet. Venous whole blood carbon dioxide content was estimated as well as oxygen-combining power.[9] Whole blood lactic acid was estimated by the method of Clausen[10] in the first five cases and by the method of

9. Van Slyke, D. D., and Stadie, W. C.: The Determination of the Gases of the Blood, J. Biol. Chem. **49**:1, 1921.

10. Clausen, S. W.: A Method for the Determination of Small Amounts of Lactic Acid, J. Biol.Chem. **52**:263, 1922.

Friedemann, Cotonio and Shaffer[11] in the last four cases. Venous serum chloride was determined by the method of Van Slyke.[12] The carbon dioxide curve was constructed from data obtained by analyzing oxalated whole blood equilibrated at 38 with mixtures of air and carbon dioxide at pCO_2 20, 40 and 70 millimeters of mercury. The carbon dioxide contents were corrected to venous oxygen saturation by the factors of Buckman, Adams, Smith and Edwards,[13] and the p_H was calculated according to Austin and Cullen.[14] The venous point was located on the curves, and from this point the venous p_H was estimated. The carbon dioxide content of venous serum at a pressure of carbon dioxide of 40 mm. of mercury was also calculated, the Henderson-Hasselbach equation and the constants suggested by Austin and Cullen being used. The results are summarized in table 1.

The data are of interest from two points of view: (1) the carbon dioxide curve of infants as compared with those of adults and (2) the effect of diet on the curves.

THE COMPARISON OF THE CARBON DIOXIDE ABSORPTION CURVE OF INFANTS WITH THAT OF ADULTS

Except for a few carbon dioxide curves published by Graham and Morris[15] and Conway-Verney,[16] the accompanying curves are the only ones on infant's blood. They should show the venous carbon dioxide tension, venous p_H of infant's blood and enable one to see whether the factors determining the slope of the curve in adults also hold for infants.

Graham and Morris found the carbon dioxide content at a carbon dioxide tension of 40 mm. of mercury to be from 47 to 56 per cent by volume in normal cases. These values are somewhat higher and more variable than those of this series, which range from 17.3 to 21.8 milliequivalents per liter (39 to 49 per cent by volume). This difference is probably explained by the fact that their curves are on children rather than infants. The carbon dioxide absorption curves reported here may be considered "normals" for infants.

11. Friedmann, T. E.; Cotonio, M., and Shaffer, P. A.: The Determination of Lactic Acid, J. Biol. Chem. **73**:335, 1927.

12. Van Slyke, D. D.: The Determination of Chlorides in Blood and Tissues, J. Biol. Chem. **50**:523, 1923.

13. Buckman, T. E.; Adams, F. D.; Smith, M., and Edwards, H. T.: Chemical Studies of the Blood in Pneumonia, Boston M. & S. J. **193**:997, 1925.

14. Austin, J. H., and Cullen, G. E.: Hydrogen Ion Concentration of the Blood in Health and Disease, Medicine **4**:275, 1925.

15. Morris, N., and Graham, S.: The Carbon Dioxide Dissociation Curve of the Blood in Infancy and Childhood, Arch. Dis. Childhood **4**:298, 1929.

16. Conway-Verney, R.: The Reaction of the Blood in Children, Brit. M. J. **2**:866, 1923.

TABLE 1.—*Carbon Dioxide Absorption Curves*

Case	Date	Sex	Age, Mo.	Weight, Kg.	Oxygen Combining Power, per Cent by Volume	Venous Oxygen Content, per Cent by Volume	Oxygen Saturation, per Cent	Venous CO_2 mM	Venous CO_2 pCO_2=20 mM	Venous CO_2 pCO_2=40 mM	Venous CO_2 pCO_2=70 mM	Venous Serum Cl mM	Calculated Serum CO_2 pCO_2=40 mM	Venous p_H	Venous CO_2 Tension Mm. Hg	Blood Lactate mM	
1	July 5	F	24	8.4	15.2	9.6	63	21.4	17.0	21.5	25.9	96	28	7.43	40	—	W.M. 1,050 cc., infant diet
1	12	F	24	8.0	16.8	10.6	63	21.4	16.2	21.0	25.7	90	27	7.38	44	2.1	W.L.M. 850 cc., infant diet
2	8	F	12	8.2	18.9	15.1	80	18.7	15.5	20.3	25.7	92	27	7.41	42	—	W.L.M. 1,050 cc., infant diet
2	16	F	12	8.4	17.4	12.8	74	20.8	14.1	18.9	24.0	100	23	7.32	45	2.0	W.M. 1,050 cc., infant diet
3	19	F	24	8.5	16.8	12.1	72	19.9	14.4	19.0	23.9	97	25	7.39	40	2.5	W.M. 1,050 cc., infant diet
3*	27	F	24	8.5	14.5	11.3	78	16.8	13.4	17.3	22.4	94	22	7.33	37	—	W.L.M. 900 cc., infant diet
4	22	F	12	7.9	13.8	8.3	63	22.8	17.3	21.8	26.5	93	25	7.36	45	1.7	W.L.M. 900 cc. + karo 90
4	29	F	12	8.0	14.0	8.9	63	19.0	14.8	19.2	23.6	98	23	7.36	39	1.5	W.M. 1,000 cc., infant diet
5	Sept. 8	M	3	5.2	.....	.....	..	.....	15.8	20.8	25.9	100	28	.....	..	2.8	W.L.M. 750 cc. + karo 75
5*	12	M	3	5.1	18.1	11.0	61	16.1	11.7	16.0	20.0	..	22	7.30	40	1.5	W.M. 600 cc. + karo 45
6	9	M	6	7.2	20.2	12.8	63	20.6	14.8	20.5	25.1	100	25	7.39	41	4.5	W.L.M. 1,170 cc. + karo 100
6	15	M	6	7.4	19.4	15.7	81	19.4	15.0	20.0	25.1	93	26	7.43	38	2.2	W.M. 700 cc. + karo 45
7	21	M	12	12.0	18.6	11.4	61	20.6	15.1	19.7	24.2	94	24	7.33	45	1.7	W.L.M. 900 cc. + karo 90
7	28	M	12	12.1	18.1	13.0	72	16.9	13.5	17.7	23.0	100	23	7.36	36	1.7	W.M. 700 cc. + karo 70
8	Nov. 17	F	13	13.0	15.5	9.6	62	20.1	15.6	19.8	24.8	104	25	7.37	42	—	W.L.M. 1,050 cc. + karo 100
8	24	F	13	13.5	15.8	12.5	79	17.6	13.5	17.8	22.3	102	23	7.34	37	—	W.M. 1,050 cc. + karo 100
9	Oct. 8	F	9	6.2	17.6	11.6	66	21.2	15.3	20.3	25.5	93	27	7.39	44	2.0	W.L.M. 900 cc. + karo 90
9	14	F	9	6.5	17.6	12.4	70	20.2	14.7	19.6	24.0	97	26	7.36	44	2.0	W.M. 900 cc. + n/5 HCl 115 cc. + karo 90
Average										19.5	....	..	25.5	7.37	41		

* Not doing well; in case 3, due to slight fever; in case 5, due to mild diarrhea.

mM indicates millimols per liter; pCO_2, carbon dioxide tension, the number referring to mm. of mercury; W.M. indicates whole boiled milk; infant diet, cereal and vegetable puree; W.L.M., whole fermented lactic acid milk.

The carbon dioxide pressure of venous blood varied from 36 to 45 mm. of mercury and averaged 41 mm. The venous p_H varied from 7.32 to 7.43 with an average of 7.37. Drucker and Cullen [17] found the p_H of infant's capillary blood to be 7.34 to 7.44 by a colorimetric method. If the same difference between arterial and venous p_H holds in children as adults, the data would indicate a variation between 7.31 and 7.40 (Austin and Cullen [14]) for venous plasma.

Kydd,[18] working in Peters' laboratory and using a gasometric technic, found the following values for eight normal adults: the serum carbon dioxide content was from 56 to 65 per cent by volume with an average of 62.3 per cent; the carbon dioxide tension was from 31 to 52 mm. of mercury with an average of 44; the p_H was from 7.33 to 7.48, with an average of 7.385. These figures indicate that the venous p_H of infants' and adults' blood are substantially the same. One may conclude, therefore, that the low carbon dioxide content and tension of infants' blood when compared with adults' blood have an intimate connection. If the primary condition in children is a low carbon dioxide tension due to the somewhat more rapid breathing characteristic of babies, then one must assume that the kidneys regulate the bicarbonate concentration so that a venous p_H of about 7.37 is obtained. This would be analogous to what occurs in adults in compensating for the rapid breathing that occurs at high altitudes. On the other hand, infants may breathe rapidly because their bicarbonate is lower than adults, and the rapid breathing is analogous to that occurring in acidosis due to bicarbonate deficit. It is bootless to discuss which is primary.

The errors in the present calculation of the p_H in infants are ±0.03, and the p_H determinations are probably as accurate as are available for infants. If this is the case, the ratio of the bicarbonate to dissolved carbon dioxide in infants is $\frac{18.7}{1}$, and serum bicarbonate in milimola per liter is obtained by multiplying carbon dioxide content in per cent by volume by 0.423.

Peters, Bulger and Eisenman [19] showed that the increase in carbon dioxide of whole blood between the pressures of 30 and 60 mm. of mercury may be predicted from the oxygen combining power within

17. Drucker, P., and Cullen, G. E.: A Simple Method for Obtaining Cutaneous (Capillary) Blood From Infants and Adults for Colorimetric p_H Determination, J. Biol. Chem. **64**:221, 1925.

18. Kydd, D. M.: p_H Measured by Gasometric Technique Comparable With the One Used in this Paper, Personal Communication to the Author.

19. Peters, J. P.; Bulger, H. A., and Eisenman, A. J.: The Relation of the Hemoglobin Content of the Blood to the Form of the Carbon Dioxide Absorption Curve, J. Biol. Chem. **58**:743, 1924; The Construction of the CO_2 Absorption Curve from One Observed Point, ibid. p. 769.

0.5 per cent by volume. This has been tested in the present series, and the $\Delta\ (CO_2)_{60-30}$ predicted by the formula of Peters and his associates was found to agree with the experimental difference in carbon dioxide content between from 60 and 30 mm. of carbon dioxide pressure within 0.6 per cent by volume. On may, therefore, conclude that one may construct a carbon dioxide absorption curve between the carbon dioxide tensions of 60 and 30 mm. of mercury from one point, as recommended by Peters, Bulger and Eisenman.[19]

THE EFFECT OF DIET ON CARBON DIOXIDE ABSORPTION OF CURVES

Any change in the level of the carbon dioxide absorption curves may be appreciated best by observing the calculated level of serum bicarbonate at 40 mm. pressure of carbon dioxide. This corrects for changes in level of the curves brought about by changes in the hemoglobin content. In case 5, the child developed a slight diarrhea apparently because the

TABLE 2.—*Lactic Acid Tolerance Test*

	Whole Blood			
Time, Min.	CO_2, mM*	Cl, mM	Lactate, mM	Serum Cl, mM
0	22.3	70.5	2.8	99.0
25	22.6	74.0	4.5	
47	24.9	73.0	7.1	
90	21.2	74.0	3.8	101.0
150	24.0	76.9	2.8	100.0

* mM means millimols per liter.

whole milk was not as well tolerated as the sour milk. In this case, there is a significant lowering of the level of the bicarbonate on the whole milk, and on September 13 the baby may be considered to have a mild degree of acidosis due to the diarrhea. Unfortunately, there was not enough blood to determine the venous contents. In the other cases, the changes are not significant, and such as are present may be accounted for by changes in the chloride concentration (case 2). Furthermore, all the lactate concentrations are normal, except in case 6, on September 9 when the concentration was 4.5 milliequivalents per liter. Nothing unusual was noted to account for this. The values for venous p_H also show no significant variations, except in case 2 on the whole milk when the p_H was quite low. These results indicate clearly that blood withdrawn from infants being fed with whole lactic acid milk and with whole boiled sweet milk have substantially the same p_H and bicarbonate concentration. In case 9 hydrochloric acid milk as recommended by Faber was given to one infant without significant change in carbon dioxide absorption curves. The danger in feeding hydrochloric acid milk is probably not its effect on the blood, but rather on the kid-

neys. Von Bermuth and Duker [20] found considerable cylindruria in infants receiving hydrochloric acid milk, and they produced slight pathologic changes in the kidneys of cats by feeding them hydrochloric acid. They thought the evidence sufficient to state that hydrochloric acid might be given over short periods of time without harm, but that if given over long periods it might produce permanent renal damage.

In table 2 are given the results of a "lactic acid tolerance test" on the author after fasting overnight. Seven cubic centimeters of 85 per cent lactic acid (U.S.P.) was drunk together with about 8 Gm. of sucrose and 250 cc. of water. This is a little more lactic acid than is contained in a liter of whole lactic acid milk and was a dosage of about 80 mg. per kilogram of body weight. This is three to four times as much as would be given to a baby in a lactic acid milk feeding. There was a significant rise in the lactic acid concentration after twenty-five minutes, which reached a fairly high level in forty-five minutes but returned to normal in ninety minutes. Bradley [7] obtained a somewhat smaller increase in the blood lactic acid concentration of infants fed 150 cc. of buttermilk.

SUMMARY

Whole blood carbon dioxide absorption curves are reported for eight children while being fed whole boiled cow's milk and whole lactic acid milk; and in one infant while being fed whole lactic acid milk and hydrochloric acid milk. These changes in diet produced no significant changes in the bicarbonate concentration, the concentration of lactic acid and the p_H of the blood.

The curves may be considered essentially normal carbon dioxide absorption curves in children. They bring out the following facts:

1. The venous carbon dioxide tension in infancy is 41 ± 5.0 mm. of mercury.
2. The venous p_H of infant's blood is 7.37 ± .05.
3. The hemoglobin exerts the same influence on the slope of the carbon dioxide absorption curve as in adults.

20. von Bermuth, F., and Duker, J.: Klinische Beobachtungen über Stuhlbeschaffenheit und Zylindrurie bei Salzsäuremilch, Arch. f. Kinderh. **80**:21, 1926; Experimentelle Untersuchungen über die Zylindrurie bei Verabreichung von Salzsäuremilch, Arch. f. Kinderh. **80**:241, 1926.

THE DEVELOPMENT OF SCARLET FEVER RASH AND OF THE POSITIVE SKIN REACTION

EXPERIMENTAL AND CLINICAL STUDIES ON THE ANAPHYLAXIS THEORY OF SCARLET FEVER *

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Szontagh,[1] von Groer,[2] Meyer[3] and Dochez and Stevens[4] belong to the group of specialists who advocate the anaphylaxis theory of scarlet fever. Szontagh refers to eosinophilia as proof that scarlet fever is an anaphylactic reaction. Of course, eosinophilia is noted in an anaphylactic shock, but everyone showing eosinophilia cannot be said to be in an anaphylactic condition.

Dochez apparently based his argument on the fact that a rabbit treated with the streptococcus toxin of scarlet fever develops an anaphylactic skin reaction. It may be expected that when, after a rabbit has been treated with the toxin, the skin test is carried out on the rabbit repeatedly with the same toxin, an anaphylactic reaction should be caused by the heat-stable endotoxin contained in the Dick toxin. However, when a rabbit is treated with the heat-labile exotoxin contained in the Dick toxin and is subjected to repeated skin tests with the heat-labile exotoxin, as long as the heat-labile exotoxin contained in the Dick toxin remains pure, no anaphylaxis is believed to occur.

We conducted the skin test in more than fifty-seven school children of the first grade with the heat-labile exotoxin mentioned (the nitrogen of which had been removed to 99 per cent by means of acetic acid and alcohol). Forty-four of them gave positive, and thirteen of them negative, reactions. We subjected these two groups of children to active immunization by means of heat-labile exotoxin, injecting 26,000 skin test doses in five portions at the rate of one injection per week. Twelve

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* From the Government Isolation Hospital.

1. Szontagh: Monatschr. f. Kinderh. **22**:150, 1922; Jahr. f. Kinderh. **68**:281, 1908; **78**:497, 1913; **107**:45, 1924.

2. von Groer: Monatschr. f. Kinderh. **37**:558, 1927.

3. Meyer, S.: Deutsche med. Wchnschr. **49**:509, 1923; Ztschr. f. Kinderh. **43**:258, 1927; Med. Klin. **17**:450, 1921.

4. Dochez and Stevens: J. Exper. Med. **46**:487, 1927; Proc. Soc. Exper. Biol. & Med. **24**:429, 1927.

days later, we conducted retests with the heat-labile exotoxin and were surprised to note that the forty-four children who had given positive reactions gave negative reactions, while the thirteen who had given negative reactions before the immunization still gave these. In other words, it seemed to be demonstrated that as long as the heat-labile exotoxin is pure, it cannot cause an anaphylactic reaction. On the other hand, as to the children tested by means of heat-stable endotoxin before and after immunization with heat-stable endotoxin, those who had positive reactions before the immunization continued to yield them, while of those who had negative reactions, 31 per cent gave positive reactions. In seventy school children of the first grade who were subjected to the skin test with the heat-stable endotoxin before and after active immunization with the streptococcus antitoxin according to Ramon's method, the rate of anaphylactic reactions to the heat-stable endotoxin gradually increased to 67 per cent after the second injection; 85 per cent after the third and 94 per cent after the fourth, as reported previously.

According to von Groer, who spoke at the medical conference in Budapest in 1927, the Dick reaction, like the tuberculin reaction, may be inhibited by epinephrine and exacerbated by caffeine, but no such phenomenon is observed with the diphtheria toxin, and on this ground he contended that the Dick reaction, unlike the Schick reaction, is no toxic reaction to the toxin, but a vascular reaction or an anaphylactic reaction the same as the reaction to tuberculin.

He further stated that while the streptococcus toxin is nontoxic, it causes an anaphylactic rash to appear only on those who have had a streptococcus infection. In the experiments conducted in this hospital (by means of 1 per cent caffeine and 10 per cent solution of epinephrine) the exacerbating power of caffeine could not be observed, but as to the inhibiting power of epinephrine over the Dick reaction, von Groer's theory was confirmed. Again, experiments on the Schick test (with the diphtheria toxin in 1:300 dilution) showed no effect of epinephrine as stated by von Groer. However, the mere fact that, like the tuberculin reaction, the Dick reaction is inhibited by epinephrine can scarcely be ascribed directly to its being an anaphylactic reaction. For, in one of our experiments, when a patient in the convalescent stage of diphtheria who had been treated with horse serum received an injection of 0.1 cc. of the same serum the injection produced an anaphylactic reaction, but epinephrine could not inhibit this reaction (in other words, so long as epinephrine cannot inhibit a pure anaphylactic reaction, it would seem hasty to consider the positive Dick reaction an anaphylactic reaction on the basis of the mere fact that epinephrine inhibits it the same as the tuberculin reaction).

Another point suggests itself to us in this experiment. It is that the inhibition of the Dick reaction by epinephrine seems less because of

the operation of the latter on the vascular system than because of destruction of the Dick toxin. The local vascular effect of epinephrine completely disappears in about four hours, but when the Dick test has been carried out and epinephrine applied, the reaction remains in an extremely inhibited condition even after the lapse of twenty-four hours. This leads us to think that the diphtheria toxin may be destroyed by epinephrine.

Further, von Groer regarded the reaction at issue to be a vascular reaction and not a toxic reaction. We ourselves consider the Dick test to be an inflammatory vascular reaction. The anaphylactic reaction is always an inflammatory vascular reaction, but we cannot be sure that conversely all inflammatory vascular reactions are anaphylactic. Remembering how the heat-labile exotoxin contained in the Dick toxin produces a marked red skin reaction in such animals as white pigs and goats that have not been treated previously, we cannot say that unlike the tuberculin reaction, it is not a reaction to the toxin. To us, this point seems to stand much in the way of the anaphylaxis theory. Conversely, the heat-stable endotoxin never causes a red skin reaction in a white pig that has not been sensitized. As stated, the skin reaction to the heat-stable endotoxin is an anaphylactic reaction and is produced only in those who are immune to the scarlet fever streptococcus (adults or persons actively immunized).

Further, von Groer declared the scarlet fever toxin to be nontoxic. Such a statement cannot be expected from any one who has ever carried out immunization with this toxin. That which is nontoxic is the heat-stable endotoxin left after the exotoxin contained in Dick toxin has been eliminated. Von Groer went on to remark that the Dick toxin, whether it is boiled or raw, remains the same in the conduct of a test (conceding that such cases are met with in the skin tests conducted on immunized persons).

To us it seems difficult to call the reaction to the Dick test an anaphylactic reaction, since the reaction varies according to the degree of dilution of the toxin when the skin test is carried out with the heat-labile exotoxin. If the positive Dick reaction is an anaphylactic reaction, the rate of positive reactions should increase with age. However, from the experiments made in this hospital, the highest rate of positive reactions is observed in children between 3 and 5 years old, while the rate sharply decreases in adults. How can this fact be explained?

Those who give positive reactions to the Dick toxin have a higher scarlet fever morbidity than those who give negative reactions, and the morbidity rate rises higher proportionately to the degree of Dick positivity; while among those who are immune the morbidity is less, and, even if they are infected, their condition is less likely to become serious.

Von Groer also stated that the scarlet fever rash is developed as an anaphylactic reaction only in a person who has been sensitized previously with scarlet fever streptococcus. If this is true, cases of infection with scarlet fever should increase in number among adults as they grow older. But the fact remains that a sharp decrease in number is noticed. This is ascribed by von Groer to desensitizing. However, desensitization seems to us to be only temporary, anaphylaxis soon returning; so that no permanent desensitization is believed to be acquired.

Suppose that the positive skin reaction obtained by means of the heat-labile exotoxin and the scarlatinal rash developed in a case of scarlet fever is not a toxic reaction but an anaphylactic reaction. How can one account for the superior efficacy of the antitoxin in neutralization of the Dick toxin? Concerning this point, no advocate of the anaphylaxis theory has yet given a convincing explanation.

In experiments in this hospital, the anaphylactic reaction caused by the heat-stable endotoxin could not be neutralized with the antitoxin, which leads us to conclude that the effect of the antitoxin is to neutralize the heat-labile exotoxin contained in the Dick toxin by the relation between the toxin and the antitoxin.

THEORY OF "TOXIN AND ANTITOXIN"

One is tempted to call any scarlatinal rash that suggests a vascular reaction at a glance an anaphylactic reaction, particularly because of the presence of eosinophilia. We ourselves consider it to be an allergic reaction in a broad sense. However, when in such case we pronounce it to be an allergic (anaphylactic) reaction in the narrow sense of following previous sensitization, we bump our heads against these various difficulties that, as stated, are hard to explain. To our mind, the points at issue can be explained without falling back on anaphylaxis in the narrow sense. In other words, so long as the antitoxin retained in the mother's body remains in the new-born child, the child gives a negative reaction to the Dick toxin and shows a low morbidity to scarlet fever. About the time that the passive immunity derived from the mother disappears after the suckling stage, that is, at about the age of 3 years, both positivity to the Dick test and morbidity to scarlet fever rise, while, as the child grows older, it gradually comes to give negative reactions in the Dick test, through the natural immunity that it acquires, and shows also a decreasing morbidity. The positive reaction to the Dick test and the scarlet fever rash are ascribed to the heat-labile exotoxin, and the negative reaction to the Dick test and the therapeutic effect of the antitoxin should be regarded as the relation of "antitoxin to toxin."

THE SCARLATINAL RASH INTERPRETED HYPOTHETICALLY AS AN ANAPHYLACTIC REACTION IN THE NARROW SENSE

If the scarlatinal rash is interpreted hypothetically as an anaphylactic reaction in the narrow sense, the only way in which to explain the matter seems to be that at some transitional stage to scarlatinal immunity an anaphylactic reaction is caused, while no anaphylaxis appears in the person perfectly immunized. In other words, an anaphylactic reaction is developed in those children only whose serum has not yet acquired power to produce Schultz-Charlton's phenomenon when they have contracted the streptococcus infection and who still remain in a state of imperfect immunity, giving positive reactions to the Dick toxin and exposed to infection with scarlet fever. Conversely, in an adult who has acquired full immunity to the streptococcus and whose serum is able to produce Schultz-Charlton's phenomenon, no anaphylactic reaction is produced, and such a person may be considered as one who gives negative skin reactions and is nonsusceptible to scarlet fever.

Apart from the question whether or not the interpretation just given strictly coincides with the anaphylaxis theory, we have deducted our inferences from observations and experiments as follows:

1. The heat-labile exotoxin contained in the Dick toxin indicates susceptibility, while the heat-stable endotoxin also contained in the Dick toxin causes the anaphylactic reaction, as stated. Again, the fact has been brought to our attention that among the Chinese coolies and those who have a history of scarlet fever there are more persons who no longer give anaphylactic reactions to the heat-stable endotoxin than there are who manifest this reaction. It seems that the anaphylactic reaction to the heat-stable endotoxin is caused in some transitional stage to immunity, and, as stated, among people who are possessed of full immunity and are altogether nonsusceptible there are many who belong to our group 5 of those who give negative reactions in the three kinds of tests by means of the Dick toxin, the heat-stable endotoxin and the heat-labile exotoxin (although, generally speaking, the better immunized a person is, the more pronouncedly does he manifest the anaphylactic reaction).

2. The stronger the Dick reaction, the higher will both the morbidity rate and the intensity of the disease be. Conversely speaking, the weaker the reaction, the greater is the degree of immunity, according to our inferences.

3. The initial rash of smallpox is regarded as a sort of anaphylactic reaction. At least, such an initial rash is often met with in a person whose antibody content has become so low as to give susceptibility to smallpox. When the initial rash of smallpox appears at the last vaccinated area, an interesting phenomenon is often observed. The center

of the area looks pale, while an intensive reddening is shown around it, circumscribed with the initial rash of rose red. When a person on whom the Dick test has been performed becomes infected with scarlet fever (as in the case of patient H. T.), a similar phenomenon is developed: a pale area surrounded with intensive reddening, further circumscribed by ordinary scarlet fever rash. It seems that the central area has been so fully immunized as to produce no anaphylactic reaction, while the area surrounding it is still in a state of imperfect immunity, developing the anaphylactic reaction.

TABLE 1.—*Reappearance of Previous Positive Dick Reaction on Subsequent Development of Scarlet Fever*

Patients	Diameter of Reddening, Cm.	Days Intervening Between Dick Reaction and Infection
M. K.	2–2	4
I. S.	1–2	6
F. K.	2–2	2
N. F.	2–2	30
I. A.	2–2	16
S. I.	1–1	60
E. H.	2–2	28
S. A.	2–2	7
S. M.	3–4	3

TABLE 2.—*Blanching at the Site of the Previous Positive Dick Reaction on Subsequent Development of Scarlet Fever*

Patients	Diameter of Blanching, Cm.	Days Intervening Between Dick Test and Infection	Subcutaneous Doses of Toxin Injected
T. K.	7–10	14	5,000
M. A.	7–8	10	7,000
M. K.	4–9	10	7,000
T. M.	1–1	24	.....
O. H.	1–1	15	.....
H. T.	2–3	6	.....
Y. F.	2–2	17	.....
O. N.	2–2	34	.....
K. T.	2–2	7	.....

4. When one who has undergone the Dick test later develops scarlet fever, an interesting phenomenon, as stated, is often produced in the area tested.

This phenomenon in one group of persons consists of the reappearance of the previous positive Dick reaction. That is to say, in nine instances, at the onset of scarlet fever, in the area tested, intense reddening was shown in advance of the appearance of the scarlet fever rash around it. The reddening was from 1 to 2 cm. in diameter, and appeared exactly at the site of the Dick test in the forearm. From two to sixty days had elapsed between the test and the infection. In five cases, the number of the intervening days was from two to seven, while in the remaining four cases, more than fifteen days had intervened.

In another group of nine cases, the phenomenon mentioned took the form of a blanching at the site of the previous positive Dick reaction. In these nine cases, simultaneously with the infection, the site of the Dick test was free from the scarlet fever rash in an area from 1 to 3 cm. in diameter, this area showing pale. Among these were three cases of infection occurring while active immunization with Dick toxin was in progress in the upper arm. In other words, there were three persons who became infected while only incompletely immunized. In these three, both the site of the previous test on the forearm and that on the upper arm were free from the scarlet fever rash in an area from 5 to 10 cm. in diameter. The number of days intervening between the Dick test and the infection ranged from six to thirty-four. In seven patients, it was from ten to seventeen days, while in the other two it was from twenty-four to thirty-four days, respectively. In one of the patients (H. T.), who became infected on the sixth day, an anaphylactic red circle appeared around the pale center as stated.

Looking over the aforementioned groups of cases one may note that in the second group since no scarlet fever rash appeared at the site of injection with the toxin, the evidence of local immunity was fully established. In the first group, however, the initial reddening appearing in advance of the scarlet fever rash in the test area might be thought to be the anaphylactic reaction. In each person, the infection with scarlet fever occurred after subjection to the Dick test, but those of group 2 gained freedom from the rash, viz., the "Ausspar-phaenomen" or the blanching phenomenon, while those of group 1 showed the anaphylactic reaction. There must be some reason for this difference. In most of those giving an anaphylactic reaction it occurred within a week following the Dick test, while seven of nine showed the blanching phenomenon between six and seventeen days after the Dick test. This phenomenon appeared at the time when the degree of immunity attained was highest, while the anaphylactic reaction was caused among those who were in the transitional stage to immunity or in a stage of imperfect immunity. In particular, the case of patient H. T. of group 2 may be regarded as an interesting transitional type between groups 1 and 2.

In short, we might infer from the few instances enumerated that those in the transitional stage of immunity or those who are imperfectly immunized will produce the anaphylactic reaction, while those who have acquired perfect immunity will manifest no such reaction.

When the nature of the development of the positive Dick reaction or the scarlet fever rash is thus analyzed, we might infer that one who has been only sensitized or imperfectly immunized will manifest the anaphylactic reaction, give positive reactions to the Dick toxin and be subject to infection with scarlet fever. Further, we might conclude that a person perfectly immunized will produce Schultz-Charlton's phenomenon and a negative reaction to Dick's toxin and show no susceptibil-

ity to scarlet fever. Theoretically speaking, this nonsusceptibility should not be confounded with a temporary desensitization.

PUZZLES ARISING IN CONSEQUENCE OF THE ANAPHYLAXIS THEORY

1. How can one explain the occasional new-born child who presents the positive Dick reaction? Moriwaki, in this hospital, experimented on infants only a few days old who revealed positive reactions, as did their mothers. If the anaphylaxis theory is correct, such subjects are sensitized with streptococcus toxin within a few days of parturition, although this sounds far-fetched. It would appear more plausible to say that such a result is produced in the infants because of the absence of antibody in the mothers, although, generally speaking more of the mothers and infants give negative reactions.

2. If the scarlet fever rash has appeared in consequence of the anaphylactic reaction, should the fact that it suddenly disappears on injection of the antitoxin be ascribed to anti-anaphylaxis or to neutralization of the toxin by the antitoxin? How, also, can one explain by the anaphylaxis theory the "Ausspar phaenomen" of the scarlet fever rash that has been observed accidentally or as a result of some experimental operation on the skin treated with the toxin or the serum? Judged by the experience obtained in this hospital, the heat-labile exotoxin capable of producing the scarlatinal rash cannot be the substance producing the anaphylaxis, but the question is whether the antitoxin might react anti-anaphylactically. In the experiments conducted in this hospital, the anaphylactic reaction to the heat-stable endotoxin could not be neutralized by means of the anti-endotoxin.

To sum up, the nature of scarlet fever is difficult to ascertain, and further research is desirable.

SUMMARY

1. The scarlet fever rash and the Dick positive skin reactions may be ascribed to the heat-labile exotoxin contained in the Dick toxin.

2. If the scarlet fever rash and the positive skin reaction develop on the basis of anaphylaxis, this inference applies only to those who have been imperfectly immunized with the streptococcus toxin, in other words, those still in some transitional stage to immunity. For the higher the degree of immunity (as in the case of adults), the lower is the rate of scarlet fever infection and of positive skin reaction.

3. None of the following observations can be satisfactorily explained by the anaphylaxis theory: (*a*) the new-born child presenting the positive skin reaction to the heat-labile exotoxin contained in the Dick toxin directly after parturition; (*b*) the remarkable therapeutic effect of the streptococcus antitoxin, and (*c*) the neutralization of the toxin by the streptococcus antitoxin in the skin of a human being.

EFFECT OF TONSILLECTOMY AND ADENOIDECTOMY ON DIPHTHERIA IMMUNITY

PERSISTENTLY POSITIVE SCHICK TESTS IN A SMALL COMMUNITY *

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It is generally accepted that patients who have had their tonsils completely removed rarely have diphtheria. Schick and Topper[1] recently presented statements from several clinicians of wide experience which confirm this clinical impression. They presented results of Schick tests six months after tonsillectomy on 100 children who just previous to tonsillectomy had positive reactions to the Schick test. The age of these children ranged from 1 to 13 years. It was found that 82 per cent gave negative reactions to the Schick test and that only 18 per cent gave positive reactions. The percentage was the same in the group of those who were from 1 to 6 years of age as it was in the group of those who were from 6 to 13 years of age. In connection with this study they did Schick tests on 200 children who were admitted consecutively to the pediatric ward of a hospital and who previously had undergone tonsillectomy. Among these children, 81 per cent showed a negative reaction and only 19 per cent a positive one. Even among the patients who were less than 6 years of age, 75 per cent showed a negative reaction. Schick and Topper concluded from their results that tonsillectomy seems to have favored the development of humoral immunity against diphtheria. But they also considered the possibility that the children, living as they did in congested districts, might have been exposed to infection by organisms of diphtheria immediately after operation and that this mild infection might have stimulated the production of antitoxin or, according to Hirszfeld's idea,[2] that other infections established as an immediate consequence of the operation might have raised the amount of antibodies against diphtheria to a level high enough to give a negative Schick test after tonsillectomy. Schick and Topper's study was done in New York.

* Submitted for publication, May 21, 1930.

* Section on Pediatrics, the Mayo Clinic.

1. Schick, Bela; and Topper, Anne: Effect of Tonsillectomy and of Adenoidectomy on Diphtheria Immunity, Am. J. Dis. Child. **38**:929 (Nov.) 1929.

2. Hirszfeld, Hanna; Hirszfeld, L., and Brockman, H.: On the Susceptibility to Diphtheria (Schick Test Positive) with Reference to the Inheritance of Blood Groups, J. Immunol. **9**:571 (Nov.) 1924.

Recently I have made Schick tests on 883 children of a small community (Rochester, Minn.) whose ages ranged from 1 to 18 years. By this is meant that each subject had reached his first birthday but had not passed his eighteenth. Corresponding value attaches to expressions "6 to 18 years," etc. The results are at variance with those obtained by Schick and Topper. I have divided the children into four groups. In group 1 there were 411 children who had not been subjected to measures for the production of active immunization against diphtheria and whose tonsils had not been removed. In this group there were 99 children who had not reached their sixth birthday, 4 of whom showed negative reactions. Two of these had previously had diphtheria. There

Immunity to Diphtheria in Relation to Tonsillectomy in a Rural Community

Age, Years	Group 1			Group 2			Group 3			Group 4		
	Negative	Positive	Total	Negative	Positive	Total	Negative	Positive	Total	Negative	Positive	Total
1 to 2*	..	..	..	..	..	..	4	..	4	..	..	..
2 to 3	..	5	5	..	..	..	11	..	11	..	..	..
3 to 4	..	5	5	..	4	4	11	..	11	..	..	..
4 to 5	..	5	5	..	..	..	6	..	6	..	..	..
5 to 6	4	80	84	..	7	7	16	11	27	1	..	1
6 to 7	5	49	54	..	8	8	5	2	7	..	..	..
7 to 8	4	21	25	1	8	9	6	3	9	..	..	..
8 to 9	6	30	36	1	7	8	4	3	7	1	..	1
9 to 10	9	21	30	3	2	5	10	2	12	2	..	2
10 to 11	5	6	11	2	4	6	9	1	10	2	2	4
11 to 12	6	14	20	2	3	5	19	2	21	11	1	12
12 to 13	5	9	14	1	5	6	19	4	23	16	6	22
13 to 14	4	30	34	5	5	10	26	5	31	31	1	32
14 to 15	5	30	35	3	11	14	19	7	26	21	10	31
15 to 16	2	23	25	2	6	8	12	11	23	12	7	19
16 to 17	1	24	25	..	3	3	8	2	10	4	5	9
17 to 18	..	8	8	..	3	3	..	8	8	..	2	2
Total	58	353	411	20	76	96	185	56	241	101	34	135

* This means that the subjects had reached their first birthday and had not passed their second; other age groups are similarly composed.

were 312 children between the ages of 6 and 18 years, 52 (16.6 per cent) of whom gave negative reactions. In the group as a whole, 13.6 per cent of the Schick tests gave negative results.

In group 2 there were 96 children who had undergone tonsillectomy more than six months previously but who had not been subjected to measures for the production of active immunization against diphtheria. Nineteen had not reached their seventh birthday; in all of these Schick tests gave positive results. Of 77 children between 7 and 18 years of age, 20 (25.9 per cent) gave negative reactions. In the group as a whole 20.8 per cent gave negative reactions.

In group 3 there were 241 children who had received toxoid or toxin-antitoxin and who had not had their tonsils removed. Thirty-two of these children had not reached their fifth birthday; all of these gave negative reactions. There were 209 children between the ages of

5 and 18 years, 153 (73.2 per cent) of whom gave negative reactions. In the group as a whole 76.7 per cent gave negative reactions.

In group 4, there were 135 children who had received toxoid or toxin-antitoxin and whose tonsils had been removed more than six months previously. All of the 135 children in this group were between the ages of 5 and 18 years; 101 (74.8 per cent) of them gave negative reactions.

The children in group 1 had not been subjected to any treatment which, judged on the basis of Schick and Topper's report, would tend to enhance their immunity, whereas those in group 2 had undergone tonsillectomy, which, in Schick and Topper's experience, seemed to enhance immunity. Nevertheless, in group 1, of the 23.8 per cent of the children who had not reached their sixth birthday, 4 per cent gave negative reactions. In group 2, of the 19.7 per cent of the children who had not reached their seventh birthday, none gave negative reactions. These results certainly do not seem to indicate that tonsillectomy has a beneficial effect on humoral immunity. If results in all ages taken together, in groups 1 and 2 are considered, it is seen that there were 7.2 per cent more negative tests in the group of those who had undergone tonsillectomy. In comparing groups 3 and 4, it is seen that the percentage of negative tests was 1.9 per cent higher in the group in which tonsils had not been removed. Neither of these variations is sufficiently large to be significant.

Altogether the number of tests is too small to allow accurate deductions. The results of these tests, however, are in striking contrast to the results of Schick and Topper as to the increase of humoral immunity caused by tonsillectomy. The results that I obtained indicate that tonsillectomy has no effect on humoral immunity against diphtheria in a small community (population of 20,000). As to the incidence of diphtheria in Rochester, there have been only 30 cases of diphtheria in the last five years, and of these, 7 cases were definitely imported and resulted in 3 secondary cases. Moreover, there is wide variation from the normal susceptibility to diphtheria as given in the table compiled by Schick and Topper, from the statistics gathered by Park, Zingher, Von Groer, and Kassowitz. There seems to be marked difference in susceptibility to certain diseases between children living in congested districts and those living in small communities.

RAPIDITY OF IMMUNIZATION WITH DIPHTHERIA TOXOID *

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In a previous report,[1] we submitted our results with the use of diphtheria toxoid, concluding that this material has a high immunizing value, and that, by virtue of certain important advantages that it possesses, it recommends itself as an ideal agent in vaccination against diphtheria. Recent additional reports in this country [2] have added to the accumulating evidence in support of this contention. It is our purpose here simply to record observations on the rapidity of production of the immunity with diphtheria toxoid under comparatively minimal requirements.

Rapidity of Immunization with Two Injections (1 Cc. Each) of Diphtheria Toxoid

Group	Number of Subjects with Positive Reactions to Schick Test	Number of Weeks Between Injections	Results of Schick Retest	
			Number of Weeks After Second Injection	Negative Schick Reactions
I	50	3	3	29 (58.0%)
II	44	3	9	35 (79.5%)
III	65	3	16 to 22	60 (92.3%)

To determine the rapidity with which immunity is obtained following two injections of 1 cc. of toxoid, three weeks apart, we retested three different groups of adults (nurses and medical students) at three, nine and sixteen to twenty-two weeks, respectively, after the second injection. As shown in the table, in a group of fifty subjects, a negative Schick reaction developed in twenty-nine or 58 per cent three weeks after the

* Submitted for publication, June 4, 1930.

* From the Department of Pediatrics and Infectious Diseases, University of Michigan.

1. Weinfeld, G. F., and Cooperstock, M.: Comparative Effects of Diphtheria Toxoid and Toxin-Antitoxin as Immunizing Agents, Am. J. Dis. Child. **38**:35 (July) 1929.

2. Dick, G. F., and Dick, G. H.: Comparative Value of Toxoid and Toxin-Antitoxin Mixtures, J. A. M. A. **92**:1601 (June 8) 1929. Schwartz, A. B., and Jenner, F. R.: The Comparative Value of Toxoid and Other Agents in the Immunization of the Preschool Child Against Diphtheria, Am. J. Dis. Child. **39**:504 (March) 1930.

second injection. In a second group of forty-four subjects it was found that in thirty-five or 79.5 per cent the reaction had become negative in nine weeks. A third group, retested at the end of from sixteen to twenty-two weeks, revealed that of sixty-five subjects, sixty or 92.3 per cent showed negative reactions to the Schick test.

We chose to retest several separate groups rather than to perform repeated retests on one single group, in order to obviate the possibility of misinterpretation that would arise from the repeated use of the small amount of toxin employed in the Schick test. For it has been shown by Cowie,[3] and emphasized by Glenny,[4] that repeated injections of small amounts of toxin, even as minute as that used in the Schick test, may in themselves be of sufficient immunizing power to bring about a negative reaction.

COMMENT

Practical procedure in diphtheria prophylaxis suggests the employment of a minimal number of injections for the production of an optimal immunity rate. It has been the custom in this clinic in the routine procedure for diphtheria prophylaxis with toxoid to use two injections of 1 cc. each, with an interval of three weeks between injections. Our experience with this method makes us feel that the immunity produced is of sufficient rapidity and efficiency to make it adequate in routine vaccination. The number of patients who still show positive reactions to the Schick test at the end of approximately six months is too small to warrant a routine procedure of three injections. A third injection administered at the end of six months to those subjects who still give positive reactions to the Schick test will probably be sufficient to immunize most of the small remaining number.

In comparing the rapidity of immunization in our series with that reported by other observers who also employed two injections, considerable variation is found. Ramon and Helie[5] stated that from 90 to 95 per cent are immunized in from five to eight weeks. Maloney and Fraser,[6] using two injections of 0.5 cc. each, four weeks apart, found that 70 per cent of their subjects gave negative reactions seven weeks after the second injection. Zingher,[7] likewise employing two injections

3. Cowie, D. M.: Observations on the Intradermal and Repeated Intradermal Injection of Diphtheria Toxin with Reference to the Schick Test, Am. J. Dis. Child. **12**:266 (Sept.) 1916.

4. Glenny, A. T.: The Principles of Immunity Applied to Protective Inoculation Against Diphtheria, J. Hyg. **24**:301, 1925.

5. Ramon, G., and Helie, I. G.: Diphtheria Prophylaxis in France, J. A. M. A. **91**:1028 (Oct. 6) 1928.

6. Maloney, P. G., and Fraser, C. J.: Immunization with Diphtheria Toxoid, Am. J. Pub. Health **17**:1027, 1927.

7. Zingher, A.: Immunity Results with Diphtheria Toxoid and 1/10 L+ Mixtures of Toxin-Antitoxin, Proc. Soc. Exper. Biol. & Med. **22**:462, 1925.

of 0.5 cc. each, but with a two week interval, found that in 86.4 per cent of his subjects, the Schick test was negative at the end of six weeks. Bloomberg and Fleming [8] reported an immunity of 84 per cent at the end of eight months, with the employment of two injections of 0.5 and 1 cc., respectively.

It is evident that the various results reported do not lend themselves to exact comparison because of obvious differences in the methods employed. These differences involve such factors as the dosage and spacing of injections, and the age and the environmental conditions of the subjects studied. The size of injections used by the different workers mentioned varies; some have used 0.5 cc. for both injections, others 0.5 cc. for the first and 1 cc. for the second injection. The interval between injections is a factor of considerable importance. Injections spaced too closely may bring about the so-called "negative phase" in circulating antitoxin and a delay in the production of immunity. For example, in a group of twenty-seven subjects, each of whom had received two doses of 1 cc. of toxoid, with an interval of only one week between injections, we found that the Schick test was negative in only 29.3 per cent from three to five weeks after the second injection. The result seems significant when compared with the much higher immunity of 58 per cent obtained after a comparable time with the same dosage, but with intervals of three weeks between injections. In comparing results, it is likewise important to know the age and the environmental factors of the groups studied. It is well known that in a group of persons from a rural community there will be a high incidence of positive reactions to the Schick test because of less opportunity for the production of a natural active immunity that comes from close human contact. Glenny pointed out that any group with a high rate of susceptibility is difficult to immunize, and that the effectiveness of any antigenic agent can be proved by its ability to immunize such a group. A large number of our subjects were adults from rural districts, and it may be that a more rapid immunity might have been obtained had an urban group been studied.

SUMMARY

Observations are recorded on the rapidity of immunization with the routine employment of two injections of diphtheria toxoid, 1 cc. each, with an interval of three weeks between injections.

Of a group of fifty subjects retested three weeks after the second injection, twenty-nine or 58 per cent were found to give negative reactions to the Schick test. In a second group, consisting of forty-four subjects, it was found that thirty-five or 79.5 per cent gave negative

8. Bloomberg, M. W., and Fleming, A. G.: Diphtheria Immunization with Diphtheria Toxoid (Anatoxin-Ramon), Canad. M. A. J. **17**:801, 1927.

reactions nine weeks after the second injection. In a third group of sixty-five subjects, sixty or 92.3 per cent showed a negative reaction from sixteen to twenty-two weeks after the second injection.

It is suggested from our results and those reported by others that the employment of two injections of 1 cc. each, three weeks apart, is, for practical purposes, an adequate routine procedure in diphtheria vaccination. It is pointed out that spacing the injections too closely may delay the production of immunity.

BILE SALT HEMOLYSIS IN NEW-BORN INFANTS AND ITS INHIBITION BY THE BLOOD SERUM *

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Red blood cells are hemolyzed by various agents, such as saponin,[1] cobra venom [2] and mushroom toxins,[3] both in vivo and in vitro. The blood serum has the power of protecting the red cells against greater concentrations of these agents than the cells can withstand alone. Bile salts have the property of hemolyzing red blood cells, and the red cells are protected against such hemolysis by their blood serum.[4] Of all the various hemolytic agents, the bile salts are the most interesting from a clinical point of view because of the question as to whether or not bile salts existing in the blood stream as the result of hepatic obstruction may cause hemolysis. Ponder has contributed an immense amount of painstaking work on this phenomenon.

Donnelly and Mitchell [5] found that the degree of the hemolyzing power of bile salts for normal red blood cells, as well as of their protection by blood serum, was surprisingly constant, in fact, almost always the same for normal individuals. Clark and Evans,[6] using sodium oleate as a hemolytic agent on guinea-pig's corpuscles protected by human serum, found that the protection was diminished in conditions of blood disturbance. This was most marked in hemolytic conditions or in those in which the spleen was involved. Protection was also much

* Submitted for publication, June 7, 1930.

* From the Department of Pediatrics, Rush Medical College, of the University of Chicago, and from the Presbyterian Hospital.

1. Ransom, F.: Saponin and Its Antidote, Deutsche med. Wchnschr. **27**:194, 1901.

2. Much, H., and Holzmann, W.: A Blood Reaction in Mental Diseases, Munchen. med. Wchnschr. **56**:1001, 1909.

3. Ford, W. W.: The Toxin and Antitoxin of Poisonous Mushrooms, J. Infect. Dis. **3**:191 (Feb.) 1906.

4. Bayer, G.: Untersuchungen über die Gallenhämolyse, Biochem. Ztschr. **5**: 368, 1907.

5. Donnelly, J. L., and Mitchell, A. G.: Studies on Bile Salt Hemolysis, Am. J. Physiol. **79**:297 (Jan.) 1927.

6. Clark, H. M., and Evans, F. A.: One Factor in the Mechanism of Hemolysis in Hemolytic Anemia, Bull. Johns Hopkins Hosp. **21**:354 (Oct.) 1920.

decreased in pernicious anemia, but the decrease varied greatly. Sanford and Ashby[7] found that the amount of bile salts necessary to cause hemolysis was increased in hepatic jaundice.

Idiopathic jaundice in the new-born infant has occasioned much study, and considerable discussion has taken place as to the mechanism involved. As the hemolytic action of bile salts and the protection of the red corpuscles by the serum apparently vary in hepatic and anhepatic jaundice, a study of the effect of these agents on the blood of new-born infants was made.

MATERIAL

The infants studied were from the maternity wards and varied in age from 2 to 12 days. Ten normal new-born infants who presented no clinical signs of jaundice were used to establish a normal series. In none of these infants was the icterus index over 30. Twenty-five new-born infants who presented clinical signs of jaundice and whose icterus index was over 30 were studied.

METHOD

The bile salts used consisted of a mixture of 60 per cent sodium glycocholate and 40 per cent sodium taurocholate, prepared in a manner similar to that used by Donnelly and Mitchell, and kept over sulphuric acid. The solution was prepared by dissolving 0.1 Gm. in 50 cc. of normal salt solution, 0.05 cc. of solution, therefore, containing 0.0001 Gm.

Six cubic centimeters of blood was drawn from the longitudinal sinus in an air-dried syringe. Two cubic centimeters of this blood was used in preparation of the corpuscle suspension. This was put into a test tube containing 9 cc. of normal salt solution and 1 cc. of 1 per cent sodium citrate. The tube was centrifugated, and the corpuscles were washed twice in normal salt solution. The corpuscles were then diluted with four times their volume of salt solution. The remaining 4 cc. was allowed to clot, and the serum was withdrawn and used at once.

In performing the test, dry 1 by 10 cm. test tubes were used, and the bile solution was placed in them in varying proportions. Physiologic solution of sodium chloride was then added to make the total volume of each tube 5 cc. Two drops of the corpuscle suspension were added to each tube, and the tubes closed with dry cork stoppers. They were inverted every fifteen minutes for two hours and then centrifugated. The lowest concentration of bile salts causing hemolysis was compared with a standard tube containing corpuscles and salt solution, and was considered to be the hemolytic amount.

For the series of tubes testing the inhibition of hemolysis by blood serum, the same procedure was followed, but with the addition of 0.2 cc. of serum to each tube.

RESULTS

In the case of the normal new-born infants, the corpuscles were never hemolyzed with less than 0.001 Gm., or with more than 0.0018

7. Sanford, H. N., and Ashby, J. S.: A Differentiation of Hepatic and Anhepatic Jaundice by Bile Salt Hemolysis, J. Lab. & Clin. Med. **13**:867 (June) 1928.

Gm., of bile salts per five cubic centimeters, nor did the serum give protection with less than 0.007 Gm. or with more than 0.008 Gm. of bile salts. Comparing this with the normal standard as obtained for the adult, we find the minimum for hemolysis in the case of the adult to be 0.0008 Gm. and the maximum 0.0015 Gm., and the minimum for protection by the serum to be 0.0051 Gm. and the maximum 0.0065 Gm. The corpuscles of the new-born infant, at least for the first twelve days of life, are more resistant to hemolysis by bile salts than are adult corpuscles, and the serum gives more protection.

In the case of the infants with idiopathic jaundice, the corpuscles were never hemolyzed with less than 0.001 Gm., or with more than 0.0018 Gm. of bile salts per five cubic centimeters, which is similar to the observations in the normal cases. The serum never gave protection with less than 0.007 Gm. or with more than 0.009 Gm., except in one

TABLE 1.—*The Lowest Concentration of Bile Salts Producing Hemolysis of Blood Corpuscles of Normal New-Born Infants and of Adults*

Age, Days	Corpuscles Alone	Serum and Corpuscles
2	0.0015*	0.008*
3	0.0012	0.007
4	0.001	0.007
5	0.0018	0.008
6	0.0012	0.008
7	0.001	0.008
8	0.0018	0.008
9	0.001	0.008
10	0.0012	0.009
12	0.0018	0.008
Adult	0.0008 (minimum)	0.0051 (minimum)
Adult	0.0015 (maximum)	0.0065 (maximum)

* Expressed in grams per five cubic centimeters.

case in which on the second day there was protection with 0.01 Gm. In other cases on the same day of life, protection was had with 0.009 Gm. This also corresponds to the normal. In three cases of congenital syphilis and in one case of hemorrhagic disease of the new-born, also, the observations were within normal limits.

COMMENT

The clinical results of hemolysis by bile salts in the adult has occasioned much discussion. Lichtenstein[8] believed that in hemolytic jaundice disease of the bone marrow is the primary disturbance, and that the irritation from the pathologic marrow acts on the blood-destroying apparatus, stimulating it to excessive function. This, of course, brings about the question of the relation of the bile pigment present in hepatic involvement to the jaundice of blood disturbance.

8. Lichtenstein, A.: Urobilin as an Index of Blood Destruction, Nederl. tijdschr. v. geneesk. 1:2648 (June 13) 1925.

Rich [9] was able to find bile pigment from hemoglobin in tissue culture, but Rich and Bumstead [10] were unable to demonstrate an enzyme having power to convert hemoglobin into bile pigment. Oppenheimer [11] was unable to find any evidence in normal persons that hemoglobin was transformed into bilirubin when isolated from the general circulation or the liver.

Ashby and Sanford found that in the adult with hepatic involvement caused by a malignant condition the red blood corpuscles were

TABLE 2.—*The Lowest Concentration of Bile Salts Producing Hemolysis of Blood Corpuscles of New-Born Infants with Idiopathic Jaundice*

Age, Days	Corpuscles Alone	Serum and Corpuscles
2	0.001*	0.009*
2	0.0012	0.01
3	0.001	0.01
3	0.0015	0.008
3	0.0012	0.009
4	0.0018	0.008
5	0.0012	0.008
5	0.0015	0.009
5	0.0013	0.008
5	0.0012	0.008
6	0.0012	0.006
6	0.0018	0.009
6	0.001	0.007
6	0.001	0.008
6	0.001	0.009
7	0.0012	0.006
7	0.001	0.008
8	0.0012	0.009
9	0.001	0.007
10	0.0015	0.01
12	0.0015	0.01

* Expressed in grams per five cubic centimeters.

TABLE 3.—*The Lowest Concentration of Bile Salts Producing Hemolysis of Blood Corpuscles of New-Born Infants with Pathologic Jaundice*

Age, Days	Condition	Corpuscles Alone	Serum and Corpuscles
3	Congenital syphilis	0.0015*	0.01*
3	Congenital syphilis	0.0015	0.01
10	Congenital syphilis	0.0018	0.01
6	Hemorrhagic disease	0.001	0.01

* Expressed in grams per five cubic centimeters.

more resistant than in the normal person. This may be a resistance to hemolysis in general and not a specific resistance to that caused by bile salts. Kondo [12] found that injection of gallbladder bile into rabbits

9. Rich, A. R.: The Formation of Bile Pigment from Hemoglobin in Tissue Culture, Bull. Johns Hopkins Hosp. **35**:415 (Dec.) 1924.

10. Rich, A. R., and Bumstead, J. H.: On the Question of the Formation of Bile Pigments from Hemoglobin by the Action of Enzymes, Bull. Johns Hopkins Hosp. **36**:437 (June) 1925.

11. Oppenheimer, E. H.: Experiments on the Extrahepatic Formation of Bilirubin, Bull. Johns Hopkins Hosp. **35**:158 (May) 1924.

12. Kondo, R.: The Nature of Icterus Neonatorum, J. Pediat., Tokio **5**:1745, 1926.

caused a resistance to hypertonic salt solution. In the presence of bile salts, the blood serum does not acquire added protective power. Ponder[13] found that repeated injections of sodium taurocholate into rabbits did not increase the inhibitory power of the serum to hemolysis by taurocholate.

The actual mechanism of the hemolytic process depends on a number of complicated factors. Eggerth[14] found that washed corpuscles suspended in a solution of a p_H of 5.2, or more acid, became progressively electropositive, and that this change was coincident with hemolysis. Senn and Basu,[15] in studying the inhibitory power of blood serum and egg albumin on hemolysis by glycocholate and taurocholate, came to believe that hemolysis by bile salts is the visible sign of an irreversible peptization of the stroma. In the normal condition, the stroma is in a slightly peptosed state. Blood serum inhibits the hemolytic effect by increasing the coagulability of the stroma, and it is a peptizing agent in diphasic systems. Yeager[16] was unable to produce hemolysis with either saponin or sodium taurocholate in a system in which all of the electrolyte is replaced by isotonic sucrose. Such a system, however, cannot be obtained, since the replacement of all the electrolyte sodium chloride of a suspension of human red cells by isotonic sucrose itself results in hemolysis.

Compared with adult blood, the blood of the new-born infant has a relatively high icterus index. In the adult, the normal bilirubinemia, as represented by the bile index, is between 5 and 6, and a condition in which the index is greater than 6 or less than 15 is called "latent jaundice." In a determination of the icterus index of ten new-born infants varying in age from 2 to 14 days, Taylor[17] found that whether or not the baby was jaundiced, the bile index was never below 20. In general, therefore, the normal new-born infant, whether jaundiced or not, is in a state of "latent jaundice."

In time of appearance and greatest intensity, jaundice of the new-born infant follows closely the greatest loss of erythrocytes and hemo-

13. Ponder, Eric: Animal Experiments on the Inhibition of Hemolysis by Blood Serum, Quart. J. Exper. Physiol. **15**:25 (June) 1924.

14. Eggerth, A. H.: Changes in Stability of Potential of Cell Suspension, J. Physiol. **6**:587 (May) 1924.

15. Senn, K. C., and Basu, S. K.: On the Hemolysis of Red Blood Corpuscles by Bile Salts and the Inhibitory Action of Normal Serum on Egg Albumen, Indian J. M. Research **15**:581 (Jan.) 1928.

16. Yeager, J. F.: Studies on Acceleration and Inhibition of Hemolysis; Inhibition of Saponin and Taurocholate Hemolysis by Sucrose, Quart. J. Exper. Physiol. **19**:219 (March) 1929.

17. Taylor, R.: Icterus Index in Children, Am. J. Dis. Child. **34**:989 (Dec.) 1927.

globin by the infant. In the light of evidence pointing to the hematogenous origin of this form of jaundice, a possible correlation between these two factors at once presents itself. Heimann [18] in a comparison of fifty jaundiced and fifty nonjaundiced infants found that the hemoglobin was reduced in proportion to the intensity of the jaundice. Lucas [19] failed to verify these results, and Mitchell,[20] in a study of sixty-nine infants, did not find that those with jaundice showed any lower average erythrocyte and hemoglobin values than those without jaundice.

In the case of our clinically jaundiced new-born infants, with an icterus index of over 30, there was no increase in hemolysis by bile salts above normal or any increase or decrease in the protective power of the serum. Obviously there are not sufficient bile salts in the blood stream of the new-born infant to cause intravascular hemolysis. Ponder [21] found that the presence of 0.1 cc. of blood serum lengthened the time required for hemolysis of 1 cc. of a 5 per cent suspension of washed corpuscles by 1:1,000 solution of sodium taurocholate from one-half to seven minutes at 37 C. Even in the most intense jaundice of the new-born infant, nothing like a concentration of 1:1,000 is ever obtained. Hemoglobinuria is never a symptom of jaundice; therefore, bile salts must exert no hemolysis.

CONCLUSIONS

1. The amount of bile salts necessary to cause hemolysis of the red blood cells of the normal new-born infant is fairly constant and practically the same as in the case of the adult. The blood serum of the normal new-born infant protects at a higher concentration and at a constant value, as in the case of the adult.

2. In idiopathic icterus, there is no change in these values.

3. In three cases of pathologic jaundice due to congenital syphilis and in one case of hemorrhagic disease of the new-born, there was no change in these values.

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19. Lucas, W. P., et al.: Blood Studies in the New-Born, Am. J. Dis. Child. **22**:525 (Dec.) 1921.

20. Mitchell, J. K.: Relationship of Jaundice and Weight to Blood Values in the New-Born Infant, Am. J. Dis. Child. **38**:518 (Sept.) 1929.

21. Ponder, Eric: The Relation Between Bile Salts and Hemolysis in the Blood Stream, Brit. J. Exper. Path. **2**:289 (Dec.) 1921.

Case Reports

LATERAL SINUS THROMBOSIS COMPLICATING MASKED MASTOIDITIS

REPORT OF A CASE WITH SECONDARY SUBARACHNOID HEMORRHAGE *

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AND
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BROOKLYN

Mastoiditis in infancy is not an uncommon occurrence, and much enlightening work has been done concerning infection of the mastoid antrum in infants by Marriott,[1] Jeans and Floyd,[2] Alden,[3] Dean,[4] Floyd,[5] Sidbury [6] and others.[7] One of the dreaded dangers in mastoid infection is a complicating sinus thrombosis, because it may occur without characteristic signs or symptoms and can remain unrecognized. Especially is this true in the so-called painless type of mastoiditis, as pointed out by Kopetzky.[8]

Lateral sinus thrombosis occurring as a complication of mastoiditis in children has been reported by many investigators,[9] but as a compli-

*Submitted for publication, April 23, 1930.

*This case is reported with the permission of Dr. Kramer.

*From the Department of Pathology of the Jewish Hospital of Brooklyn.

1. Marriott, McK.: Further Observations Concerning the Nature of Nutritional Disturbances, Am. J. Dis. Child. **30**:577 (Oct.) 1925; South. M. J. **19**:157 (March) 1926; Ann. Otol. Rhin. & Laryng. **36**:686 (Sept.) 1927.

2. Jeans, P. C., and Floyd, M. L.: Upper Respiratory Infection as a Cause of Cholera Infantum, J. A. M. A. **87**:120 (July 24) 1926. Jeans, P. C.: The Diagnosis and Importance of Sinusitis and Mastoiditis, A. M. J. Dis. Child. **33**:357 (Feb.) 1927.

3. Alden, A. M.: South. M. J. **19**:360 (May) 1926.

4. Dean, L. W.: Paranasal Sinus Disease in Infants and Young Children, J. A. M. A. **85**:317 (Aug. 1) 1925; Acute Otitis in Infants, Arch. Otolaryng. **6**:291 (Sept.) 1927.

5. Floyd, M. L.: Masked Mastoiditis Simulating "Alimentary Intoxication" (Anhydremia), Arch. Otolaryng. **1**:411 (April) 1925.

6. Sidbury, J. B.: South. M. J. **20**:713 (Sept.) 1927.

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8. Kopetzky, S. J.: Laryngoscope **30**:763, 1920.

9. Atkins, R. T.: New York State J. Med. **24**:885 (Oct.) 1924. Bently, N.: Grace Hosp. Bull. **13**:10 (April) 1929. Chase, E. F.: Ann. Otol. Rhin. & Laryng. **35**:791 (Sept.) 1926. Crane, C. G.; Taylor, J. M., and Patrie, H. H.: S. Clin. North America **7**:823 (Aug.) 1927. Fraser, J. S.: Tr. Medico-Chir. Soc. Edinburgh, **75**:89, 1923-1924. Greenfield, S. D.: Acute Mastoiditis, Lateral Sinus

cation during infancy it is rare, and search of the literature reveals no patient younger than the one in the case reported here.

Kopetzky [10] mentioned the case of a child of 14 months, with recovery, in a series of twenty cases of sinus thrombosis, and that of an infant, aged 8 weeks, with recovery.[11] Braun's youngest patient was 1½ years, and in his experience, thrombosis is more apt to occur in the jugular bulb than in the lateral sinus.[12]

REPORT OF CASE

History.—J. G., a white boy, aged 7 weeks, was admitted to the hospital on Feb. 24, 1930, with the chief complaints of cough and fever of three days' duration. Both parents were living and well. The mother had had two pregnancies; the first child, a girl, died of meningitis at the age of 11 months; the second child was the patient. He was born at full term, and the delivery was normal and spontaneous. The birth weight was 6 pounds and 2 ounces (2,784.25 Gm.), and the infant had been cyanotic for four or five days after birth. No hemorrhages, desquamation or snuffles had been noted. Feeding consisted of breast milk every three hours for twenty minutes, with complementary feedings made from 15 ounces (444 cc.) of milk, 6 ounces (178 cc.) of water and 1 ounce (30 cc.) of gluconalt divided into seven feedings, which were well taken. The infant vomited occasionally. Viosterol, 9 drops, and orange juice, 1 ounce, had been administered since the age of 2 weeks. At the age of 3 weeks, the patient held his head up. There had been no illnesses or operations. The present illness began three days prior to admission, when the patient began to cough. The next day he seemed to have fever and a moist cough had developed. He vomited after every feeding. The following day his temperature rose to 101 F., and a physician was called who told the mother that the right ear was inflamed. On the day of admission, a diagnosis of bronchopneumonia was made and hospitalization advised. There were no convulsions or diarrhea.

Physical Examination.—At the time of admission the patient appeared well developed, fairly well nourished and rather cyanotic, being in no apparent respiratory distress. The skin showed a generalized cyanotic mottling and some crusting and desquamation in the right axilla, but no petechiae. There was no general enlargement of the lymph nodes. The length was 50 cm. The head appeared small, measured 34 cm. and was symmetrical. The anterior fontanel was small and measured only 0.5 by 0.5 cm.; there was no bulging. There was

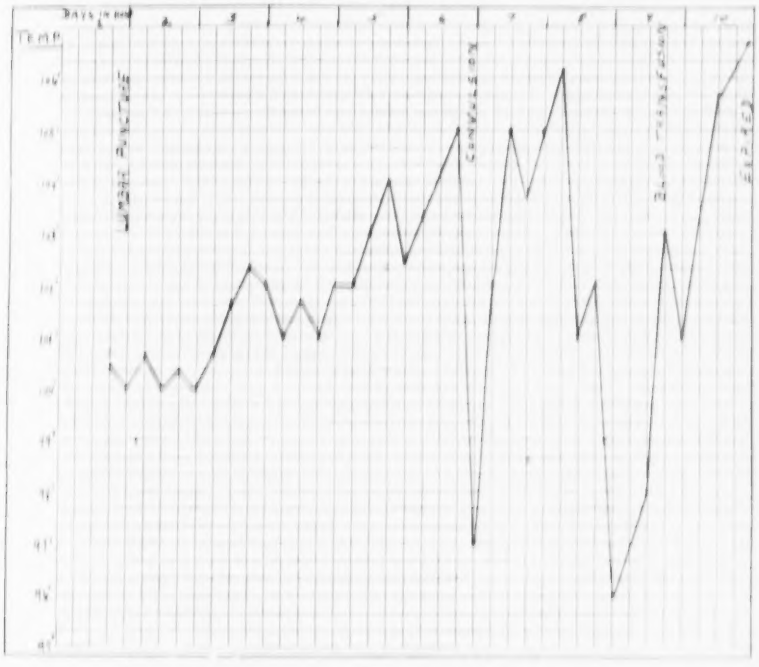
Thrombosis and Pyemia, Arch. Otolaryng. **3**:444 (May) 1926. Hamrick, D. W.: New Orleans M. & S. J. **82**:130 (Sept.) 1929. Harty, J. P. L.: Bristol Med.-Chir. J. **38**:73 (Sept.) 1921. Hays, H.: New York State J. Med. **29**:5 (Jan. 1) 1929. Kopetzky, S. J.; Laryngoscope **30**:763 (Dec.) 1920. Mahoney, P. L.: J. Arkansas M. Soc. **25**:175 (March) 1929. McComiskey, A. J.: New Orleans Med. & S. J. **80**:330 (Nov.) 1927. McLoone, J. J.: Southwestern Med. **12**:204 (May) 1928. Page, J. R.: Virginia M. Monthly **49**:378 (Oct.) 1922. Roth, A. W. J. Oklahoma M. A. **14**:45 (March) 1921. Sheldon, W. P. H.: Quart. J. Med. **20**:353, 1927. Tobey, G. L., Jr.: Tr. Am. Otol. Soc. **15**:160, 1919. Traina, S.: Valsalva **3**:116 (March) 1927.

10. Kopetzky, S. J.: Am. J. S. **30**:1 (Jan.) 1916.

11. Kopetzky, S. J.: Personal communication to the authors (March 10, 1930).

12. Braun, A.: Personal communication to the authors (March 25, 1930).

no craniotabes, and the head was somewhat retracted. The ears were normal. The eyes showed pinpoint pupils and did not react to light. There was no ptosis or strabismus. The nose was normal. The mouth showed no evidence of bleeding or ulceration. The tongue was covered with a recent feeding. The pharynx contained mucus. The tonsils were not visible. The neck showed no rigidity, masses, tenderness or swelling. The chest showed no lag or abnormal pulsations; there was no beading. The respirations were irregular. The percussion note was resonant throughout, anteriorly and posteriorly. Auscultation revealed harsh breath sounds, with an occasional consonating râle and many crepitant and subcrepitant râles throughout both lungs. The heart was not



Temperature chart for J. G., aged 7 weeks.

enlarged to percussion; the sounds were rapid, regular and rhythmic, and no murmurs were heard. The abdomen was slightly distended; the spleen was barely palable; the liver edge was not felt, and there was no rigidity, masses or tenderness. No hernias were found. The genitalia were of the normal male configuration. The extremities were normal. The knee reflex and the ankle jerk were found to be present and equally active. There were no Kernig and Brudzinski signs.

The clinical impression was microcephaly, possible intracranial birth injury, bronchopneumonia and intertrigo.

Laboratory Data.—On two occasions urinalysis gave negative results. At the time of admission examination of the blood showed: hemoglobin, 70 per cent; red cells, 3,950,000; white cells, 17,100; polymorphonuclears, 50 per cent; lympho-

cytes, 46 per cent; large mononuclears, 4. On March 2, the blood count showed: hemoglobin, 70 per cent; red cells, 3,600,00; white cells, 19,800; polymorphonuclears, 56 per cent; lymphocytes, 44 per cent. Cultures from the nose and throat were negative, and the tuberculin tests up to 3 mg. gave negative results. The Schick test gave negative results. A spinal tap was done on Februray 24, and 8 cc. of crystal clear fluid under slightly increased pressure was removed. This fluid contained three mononuclear cells and reduced Fehling's solution and gave a negative Pandy test. Roentgenograms of the extremities failed to demonstrate any osseous pathologic changes. A roentgenogram of the chest, taken on the day following admission, showed a bilateral infiltration of the hilus, which extended to the periphery. Another roentgenogram, taken on March 5, showed the same infiltration of the hilus with extension to the periphery and, in addition, consolidation at the right apex.

Clinical Course.—At the time of admission the patient's temperature was 100 F., which soon began to mount slowly without fluctuating, so that by the sixth day following admission, it had reached 105 F. After that it became intermittent and septic, fluctuating between 106.4 and 96.6 F (chart). Blood could not obtained for culture after several attempts, and it was not deemed advisable to cut down on the veins in the cubital fossa or to puncture the anterior fontanel on account of the small size of the opening and the history of cyanosis at birth.

The appetite was good; there was no vomiting or diarrhea, and fluids were well taken. The infant received a three-fourths milk mixture with 5 per cent carbohydrate. The cough was not excessive, and the cyanosis was moderate. During the next three days, however, the patient had several attacks of cyanosis and periods of apnea, which cleared up after the administration of oxygen and stimulation by hypodermic injections. The ears were examined daily and nothing abnormal was found. The nose and throat showed only slight congestion of the mucous membranes. The pupils, which had been pinpoint on admission, widened and reacted to light. There were no neurologic signs. On March 1, the sixth day following admission, a transitory convulsion occurred during which there were clonic movements of the right upper extremity and twitchings of both sides of the face. Physical examination showed the ears and pharynx normal; there were signs of frank consolidation over the upper lobe of the right lung, with scattered crepitant râles throughout both lungs. The temperature dropped to 97.6 F., and from that time on became septic and irregular. Oxygen was administered at intervals. On March 4, a transfusion of 70 cc. of blood was given. The respirations became labored, and the child died the next day.

Autopsy (performed by Dr. Lederer).—The body was that of a well developed and nourished male, about 2 months of age. The right pleural cavity contained about 200 cc. of slightly turbid, amber fluid. Culture of the fluid showed *Staphylococcus albus*. The left pleural, pericardial and peritoneal cavities contained no fluid and were normal.

The pleural surfaces of the lungs were covered with numerous hemorrhagic spots of various sizes. Scattered throughout were areas of consolidation which were most extensive in the right lower and middle lobes. The remainder showed marked congestion. The trachea and bronchi were normal.

The heart weighed 26 Gm. The auricles and ventricles were normal. The foramen ovale was closed. The musculature was pale and flabby. The esophagus and stomach were normal; the intestines were distended. The descending colon was very large and angulated; the sigmoid was considerably dilated. The cecum and caput coli were free and mobile.

The spleen weighed 10 Gm. and was purple, soft and congested. It was divided into two lobes at its upper pole. The pancreas weighed 4 Gm. and appeared normal. The liver weighed 175 Gm. and, except for pallor and cloudy swelling, did not appear abnormal. The suprarenals weighed 2 Gm. each and were normal. The kidneys weighed 12 Gm. each; the capsule stripped easily; the surface was smooth, and on section they appeared grossly normal. The ureters and bladder were normal.

The brain weighed 275 Gm. On the anterior surface of the right hemisphere was a large hemorrhage extending from the superior longitudinal sinus. The right lateral sinus sigmoid contained a firm thrombus which extended to the torcular herophili and the entire length of the superior sagittal sinus. The right jugular vein was also occupied by a thrombus, as well as the posterior portion of the left sinus, but the thrombus did not extend into the left lateral sinus. The left tympanum was normal. When the tympanum was opened on the right side, bright yellow pus exuded. The mastoid process on this side was necrotic and contained pus which on smear revealed gram-negative diplococci. A culture of the pus was sterile.

Microscopic Examination.—There was consolidation of the entire lobules of the lungs, the alveolar spaces being filled with polymorphonuclear cells and a few red blood cells. There were scattered areas within these consolidated lobules, showing only thick fibrinous deposits with a few polymorphonuclear cells. Marked congestion was present throughout, with some alveoli completely filled with red blood cells. A few areas of edema were present. The bronchioles were filled with a purulent exudate, and the walls showed cellular infiltration. There were small pneumonic areas scattered throughout, intermingled with areas of compensatory emphysema and ruptured alveoli. The muscle fibers of the heart appeared normal; some of the capillaries showed purulent thrombi.

The spleen showed marked congestion, with compression of the follicles. The germinal centers were not distinct. The sinuses were distended with blood. The trabeculae were hypertrophied. The pancreas was normal. The liver showed marked fatty infiltration and degeneration. The suprarenals showed marked congestion in the medulla, with granular degeneration in the cortex. The kidneys showed marked granular degeneration of the epithelium of the convoluted tubules. There were medullary congestion and hemorrhage. The glomeruli appeared normal, with many small darkly stained cells covering the capillary tufts. Some of the glomeruli appeared small and suggestive of an embolic process.

The impression was that this was a case of otitis media purulenta with mastoiditis, right sinus thrombosis and longitudinal sinus thrombosis, with subarachnoid hemorrhages over the right frontal lobe of the brain.

COMMENT

The superior sagittal sinus passes into the right lateral sinus and the straight sinus into the left lateral sinus in about 50 per cent of cases. Occasionally there is a small communication in the region of the sinuum confluens (torcular herophili). In 30 per cent of cases the superior sagittal and straight sinuses bifurcate, one branch of each passing to the lateral sinuses. In the remaining 20 per cent the sinuses are fused at the sinuum confluens. Infection may take place via the following routes: (1) most often by direct extension especially in the

pneumatic or diploic types of mastoid process or a combination; (2) through the tympanic flow to the jugular bulb, especially in acute suppurative otitis and in children in whom dehiscence of the bone may be present; (3) through the emissary veins or phlebitis of the jugular bulb; (4) through the venous radicles from the mastoid cells opening into the sigmoid sinus; (5) rarely by extension from the superior petrosal sinus. In our case the lateral sinuses fused at the sinuum confluens.

In considering obscure septic conditions in infancy, lateral sinus thrombosis complicating mastoiditis may be overlooked as a possibility on account of its great infrequency and the lack of definite clinical signs and symptoms. It occurs most frequently between the ages of 5 and 40. The right side is more often involved in the proportion of 3:2.

Primary cerebral sinus thrombosis, sometimes called "marantic" or "cachectic" is uncommon; Holt did not find a single instance of cerebral thrombosis in more than 200 autopsies on infants dying of nutritional disorders. Wyllie and his associates [13] mentioned 20 cases of cerebral sinus thrombosis. Three occurred in children aged 3 weeks, 8 months and 14 months, respectively; all were in a wasted condition and presented symptoms that suggested meningitis.

Secondary cerebral thrombosis may result as a complication of any infection of the face and scalp, especially furunculosis and erysipelas. The most common causes, however, are infections of the middle ear and accessory nasal sinus. Lateral sinus thrombosis is nearly always secondary to infection of the middle ear because of the relationship between the mastoid cells and the sigmoid sinuses.

Herz [14] incriminated injuries suffered during birth for the early cases of otitis media in infants with suppuration and complicating sinus thrombosis. The thrombosis in the lateral sinus may become retrograde and extend into other sinuses, especially the superior sagittal sinus. This causes congestion in the cerebral vein and results in subarachnoid hemorrhage, as occurred in our case.

The clinical picture as it occurs in infancy is described by various observers [15] as essentially like that of meningitis. Tobey [16] divided the cases into three groups: (1) the septic explosive type with acute onset and a picture of sepsis with sudden remissions in temperature; (2) the typhoidal type with the temperature showing a persistent irregularity

13. Wyllie, Garrod, Batton, Thursfield and Paterson: Diseases of Children, ed. 2, New York, William Wood & Company, p. 724.

14. Herz, O.: Monatschr. f. Kinderh. **32**:256, 1926.

15. Hofer, I.: Wien. med. Wchnschr. **77**:221 (Feb. 12) 1927. Kaufman, A. S.: New York M. J. **106**:1216 (Dec. 29) 1917. Blackfan, K. D.: **7**:412, 1925. Wyllie, Garrod, Batton, Thursfield and Paterson (footnote 13).

16. Tobey, G. L., Jr.: Tr. Am. Laryng. Rhin. & Otol. Soc., 1921, p. 201.

of from 1 to 2 degrees, but with slight remissions and elevations from 100 F. as a basis; (3) the latent type with no rise in temperature or a slight rise in temperature and a return to normal.

Diagnosis is based on the septic temperature and the signs and symptoms resembling meningitis. A test for determining sinus thrombosis based on changes in the spinal fluid pressure is of value in the diagnosis. This test was described by Dowman,[17] Tobey and Ayer,[18] Bruenings[19] and Perwizschky.[20] All of these investigators arrived at the same conclusions independently of one another. The test based on Queckenstedt's phenomenon consists in applying pressure over both internal jugular veins in the neck and noting on a manometer the rise in the spinal fluid pressure, which is secondary to an increase in the intracranial pressure. Ottenberg[21] suggested taking simultaneous blood cultures from both internal jugular veins, but this is not as accurate as the Tobey-Ayer test.

According to Braun,[22] the possible end-results of sinus thrombosis are: 1. The patient dies of general sepsis before the clot breaks down. 2. The clot breaks down in the center, and the abscess finally breaks through the true wall of the sinus so that the abscess within the sinus communicates with the perisinus abscess. The pus within the sinus breaks through the visceral wall of the sinus and produces a cerebellar abscess or meningitis. 4. The thrombus organizes and results in obliteration of the sinus. 5. Part or all of the thrombus becomes absorbed, resulting in recanalization of the sinus.

The treatment, of course, is surgical as soon as the diagnosis is made.[23]

Although marantic or cachetic thrombosis does occur in the course of acute infections, as in pneumonia, our case was clearly one of thrombophlebitis secondary to the mastoiditis, as shown by the facts that the clot was adherent to the sinus wall and well organized, that it was one-sided, that there was a septic temperature curve and that there was evidence of sepsis in other organs, especially in the glomeruli, in which there were changes suggestive of emboli. In marantic thrombosis one

17. Dowman, C. E.: A Simple Test for the Diagnosis of Thrombosis of the Lateral Sinus, J. A. M. A. **84**:1268 (April 25) 1925.

18. Tobey, G. L., Jr., and Ayer, J. B.: Dynamic Studies on the Cerebrospinal Fluid in the Differential Diagnosis of Lateral Sinus Thrombosis, Arch. Otolaryng. **2**:50 (July) 1925.

19. Bruenings, W.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:693, 1925.

20. Perwitzschky, R.: Arch. f. Ohren-, Nasen- u. Kehlkopfh. **116**:169, 1927.

21. Ottenberg, R.: The Diagnosis of Sinus Thrombosis, Arch. Otolaryng. **5**:43 (Jan.) 1927.

22. Braun, A.: Ann. Otol. Rhin. & Laryng. **27**:461, 1918.

23. Kopetzky, S. J.: Acute and Chronic Otitis Media and Sinus Thrombosis, Arch. Otolaryng. **10**:302 (Sept.) 1929.

would expect to find a poor nutritional state and little or no bodily reaction. Our case showed a high leukocyte count, indicating a definite bodily resistance. As to the diagnosis, one sign, that of fluctuating temperature, aroused suspicion of a sinus involvement, but the fact that the signs in the ear were negative, as well as the rarity of sinus thrombosis in infancy and the presence of a pneumonic process, tended to make the diagnosis hazardous. The subarachnoid hemorrhages must have occurred after the patient was admitted to the hospital, since spinal tap done on admission revealed no red blood cells or xanthochromic fluid.

No tenderness could be made out over the mastoid process, and there was no redness, fulness or swelling of the neck over the right jugular vein at any time.

A blood culture might have helped the diagnosis, but argument for its speaking for sepsis would have been valid.

According to the literature, mastoiditis in infancy has been shown not to be uncommon, and therefore its complications, though not as frequent as in older children, occur in infancy, and its possibility should always be kept in mind in conditions in which evidence of sepsis is present.

CONCLUSIONS

1. A case of lateral sinus thrombosis complicating masked mastoiditis with secondary subarachnoid hemorrhage in an infant, aged 7 weeks, with autopsy observations and a review of the literature is presented.

2. The possibility of lateral sinus thrombosis complicating masked mastoiditis in obscure clinical pictures of sepsis occurring in infancy should be kept in mind.

MASSIVE SUPRARENAL HEMORRHAGE IN THE NEW-BORN INFANT *

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Since the time of Moissenet and Rayer,[1] who first described massive suprarenal hemorrhage in the new-born infant in 1837, many observers have reported numerous types of suprarenal hemorrhage; the literature has been reviewed by Hamill,[2] Corcoran and Strauss [3] and others, and will merely be mentioned here in passing. Pathologists describe the small bilateral punctate hemorrhages found in the suprarenal glands of new-born infants in whom asphyxia, trauma and venous congestion are supposed to play a rôle.[4] Other etiologic factors mentioned are eclampsia in the mother,[5] infection,[6] purpura and fever in the mother,[7] thrombosis of the suprarenal veins,[8] syphilis (there are many spirochetes in the suprarenals but usually no pathologic changes),[9] hemophilia,[10]

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* Read at a meeting of the Canadian Society for Study of the Diseases of Children, June, 1929.

1. Moissenet and Rayer, quoted by Farr, C. E., and Semstroth, K.: Suprarenal Hemorrhage, Arch. Surg. **15**:627 (Oct.) 1927.

2. Hamill, S. M.: Hemorrhages into the Suprarenal Capsule in Stillborn Children, Arch. Pediat. **18**:81 and 161, 1901.

3. Corcoran, W. J., and Strauss, A. A.: Suprarenal Hemorrhage in the New-Born, J. A. M. A. **82**:626 (Feb. 23) 1924.

4. Losee, J. R., quoted by Farr, C. E., and Semstroth, K.: Suprarenal Hemorrhage, Arch. Surg. **15**:627 (Oct.) 1927.

5. Magnus, G.: Nebennierenblutungen bei Neugeborenen, Berl. klin. Wchnschr. **58**:1119, 1911. Doerner: Nebennierenblutungen bei Neugeborenen, Vrtljschr. f. gerichtl. Med. **26**:272, 1903. Dienst, A.: Neuere Untersuchungen über das Wesen der Eklampsie, Samml. klin. Vortr., 1902, no. 342. Weltmann, O. L. Nebennierenhämatoma, Wien. klin. Wchnschr. **24**:728, 1911.

6. Kempf, H.: Ueber die Bedeutung der Nebennierenblutungen für den plötzlichentod, Vrtljschr. f. gerichtl. Med. **56**:71, 1918. Riesmann: Post Mortem Reports, University Hospital, Philadelphia. Gunson, E. B.: Suprarenal Hemorrhage in an Infant, Proc. Roy. Soc. Med. (Sect. Dis. Child.) **8**:54, 1914-1915. Simmonds, M.: Ueber Nebennierenblutungen, Virchows Arch. f. path. Anat. **170**: 242, 1902. Talbot, Eustace: St. Bartholomew Hosp. Rep. **36**:207, 1900.

7. Rabinowitz, M. A.: Adrenal Hemorrhage in Infancy, Am. J. M. Sc. **166**: 513, 1923. Von Reuss, A. R.: The Diseases of the Newborn, New York, William Wood & Company, 1921.

8. Simmonds (footnote 6, fourth reference).

9. Magnus (footnote 5, first reference). Doerner (footnote 5, second reference). Weltmann (footnote 5, fourth reference).

10. Magnus (footnote 5, first reference). Von Reuss (footnote 7, second reference).

congenital deformity of the kidney and embryonic cystic processes. Toxic factors, such as burns, diphtheria, etc., are described in certain cases as playing a rôle. Elliott said that hemorrhage is due to a too great or precocious degeneration and congestion of the fetal suprarenal cortex.

A brief description of the suprarenal glands and what has been found concerning them might be of interest. They are two small endocrine glands situated on the mesial anterior poles of the kidney, the right in relation with the liver the inferior vena cava and the duodenum, and the left in relation with the spleen, the stomach and the tail of the pancreas and covered by peritoneum. In the new-born infant they are relatively large organs. During the first two weeks of life, the medulla, which at birth is composed of a small collection of cells, starts to grow; the inner zone of the cortex is destroyed and is converted into a highly vascular and often hemorrhagic connective tissue layer which collapses. The medulla grows into the collapsed framework and represents the inner layer of the original cortex. Usually the cortex of the left gland is somewhat larger than that of the right. These cortices possess a capsule and hilus through which the suprarenal vein leaves. They are divided into a yellow cortex and a reddish-brown, vascular medulla; these parts are entirely different embryologically and functionally. The cortex produces the hormone, which has been proved to be indispensable to life. The medulla belongs to the chromaffin system and produces epinephrine. Animals live perfectly well without the medullary portion, whereas total adrenalectomy causes death; this would make the cortex seem by far the more important element. Both the cortex and the medulla are capable of regeneration. In spite of a great deal of research, there still remains much to be learned concerning the exact rôle played by these two definite structures. Accessory suprarenals composing one or both parts are often found in the area contigious to the suprarenals, elsewhere in the abdomen or around the sex glands. They include the paraganglions and carotid bodies. The suprarenal gland is relatively the most vascular organ in the body. It receives six times its weight of blood per minute. Its blood supply is derived from the superior, middle and inferior suprarenal arteries, respectively, the branches of the inferior phrenic, the aorta and the renal arteries. These branches anastamose freely and form large venous capillaries that unite to form the central vein, which leaves at the hilus. The gland is very friable and vascular. It is unnecessary here to describe the histology.

It is my purpose to present briefly four cases of massive suprarenal hemorrhage which occurred in my practice (two patients died and

autopsies were performed; two recovered), and to endeavor to reach some practical conclusion concerning the diagnosis and treatment of this condition.

REPORT OF CASES

CASE 1.—A boy, weighing 7 pounds (3,175.14 Gm.) had a normal birth. The mother was a primipara, who suffered from excessive vomiting, but there was no eclampsia. The infant nursed well and appeared normal until the fourth day, when he refused to eat, seemed listless and was pale. I was called, and I found the child in a state of shock: extremely pale, showing air hunger, slight twitching and with a distended abdomen. The temperature was normal. I remarked that the infant appeared to be having a concealed hemorrhage, but at the time I did not suspect suprarenal hemorrhage and did not give treatment for it. The infant died on the fifth day. The report of the autopsy by Dr. Jacobs was as follows: He was a well nourished child. The abdomen was distended; there were no petechiae or marks externally. When the abdomen was opened, it was found to be filled with from 200 to 250 cc. of blood, partly fluid and partly clotted. The retroperitoneal tissue was infiltrated with blood, and the right suprarenal gland and kidney were embedded in a mass of clots. The suprarenal gland was the size of a small egg and was ruptured; no other hemorrhagic areas were found. The left suprarenal gland was apparently normal.

CASE 2.—In December, 1921, a full-term boy was born of a normal multipara. The delivery was easy and spontaneous. The infant cried and seemed perfectly healthy for the first three days. On the fourth day, he appeared languid and refused to eat; he was fed first with a Breck feeder, then by tube. The nurse noted that the infant was becoming pale and that his abdomen was distended. When I examined the infant, he was in shock and was pale (not icteric) and listless. He had a normal temperature. He appeared exsanguinated; the abdomen felt boggy, and a mass could be made out in the right upper quadrant. No external bleeding was discernible. Remembering my mistake of a year previously, I gave the infant a transfusion of 120 cc. of blood intravenously. The response was immediate; the color became good, and the infant was more active and interested in his food. The abdomen remained distended, boggy and bluish, with a palpable tumor mass, for three weeks. The child made an uninterrupted recovery.

CASE 3.—A full-term girl (weight, 7 pounds and 3 ounces [3,260.19 Gm.]) was born on May 24, 1927, by version and extraction. The mother was a normal multipara (no eclampsia). The infant breathed and cried spontaneously, and her condition appeared good. On the third day, she seemed listless, the temperature was 100.6 F. On the fourth day, she took the bottle fairly well; the temperature was normal. On the fifth day, the infant would not nurse and seemed more listless and pale. On the sixth day, the nurse made a record on her notes that the abdomen was distended and had a bluish tinge. On the seventh day, when I first saw the child, she was very pale (hemoglobin 40 per cent, Sahli); the temperature was normal; she was twitching slightly, and the abdomen was markedly distended and bluish. A mass could be felt in the right hypochondriac region. No petechiae or other hemorrhages were discernible. A transfusion was given at once, 95 cc. of the father's blood being given intravenously. There was an immediate improvement in color, and the infant took her feedings better. At the end of two weeks, there was still some bogginess of the abdomen, but otherwise the infant seemed normal.

CASE 4.—On May 30, 1927, a full-term boy (weight, 6 pounds and 15 ounces [3,152.8 Gm.]) was born of a normal multipara, by easy version and extraction. The infant cried vigorously following mild resuscitative methods and seemed normal until the third day, when the nurse reported collapse, pallor and refusal to eat. When examined, the infant was in a state of severe shock and was very pale, with rapid shallow respirations, a weak heart-beat and slight twitchings. The temperature was normal. The abdomen was so distended that no mass could be palpated. There were a few petechial spots on the abdomen, the neck and the scrotum. The infant was demonstrated to the house staff of the Children's Hospital as having a probable case of suprarenal hemorrhage, and preparations were made for transfusion. Before this could be accomplished, however, the infant died. Autopsy was reported by Dr. Benjamin Roman as follows: The general nutrition was good; the abdomen was distended. There were small hemorrhages in the loose connective tissue of the scalp. There were punctate hemorrhages scattered over the entire meninges of both the vertex and the base. Moderate edema was present. The cerebrum was yellowish, with waxy, punctate hemorrhages on the vertex. There were hemorrhages in the right thoracic region of the thorax. The abdominal cavity was filled with fluid blood and a few small clots (200 cc.); there was 30 cc. of fluid blood in each side of the chest. The thymus was about normal in size, and was covered with punctate hemorrhages. There was about 20 cc. of fluid blood in the pericardial sac.

There were blood cysts the size of a pinhead, on the free margins of both the mitral and the tricuspid valves of the heart. The left lung was filled with large and small hemorrhagic areas, distributed fairly evenly throughout the lungs on both sides. The retroperitoneal tissues of the abdomen were infiltrated with blood, especially in the upper part. The spleen was soft and flabby. The bile passages were patent. The stomach was filled with mucus. The mesentery was infiltrated with blood. The left suprarenal gland was apparently normal. The cortex of the kidney was pale, with small hemorrhages in the medulla. The right suprarenal gland was about the size of a large walnut; the capsule was ruptured and contained a solid blood clot. The right kidney was compressed by gross hemorrhage in and around the capsule. The scrotum was infiltrated with blood. The testes were about the size of small beans, and were hemorrhagic.

The pathologic diagnosis was: extensive hemorrhage of the right suprarenal gland and the contiguous retroperitoneal tissue, with free blood in the abdomen, and multiple gross hemorrhages in the lungs, the mesentery, the scrotum, the testes and the subcutaneous tissues of the thorax; punctate hemorrhages in the cerebral cortex, the leptomeninges and the thymus. The main diagnosis was suprarenal hemorrhages.

COMMENT

In reading over these case histories it must be apparent that there is a marked similarity in them. The onset of symptoms was between the third and the seventh day, in other words during the period of occurrence of hemorrhagic disease of the new-born infant, and I cannot but feel that this type of suprarenal hemorrhage is a part of this syndrome. The structure of the suprarenal glands and the early involution taking place in these organs may make them more susceptible at this time.

The symptoms are those of shock: listlessness, refusal of food, rapid respirations, rapidly developing anemia amounting to exsanguination

and sometimes convulsions. The rapidly falling hemoglobin is a point of differentiation from cerebral hemorrhage, with the shock and twitching that often accompany this condition. This, of course, is the clinical picture of concealed hemorrhage and is not unlike that of ruptured ectopic gestation. Twitching may be due to extreme anemia or to petechial hemorrhages in the brain. Distention or bagginess of the abdomen, with or without bluish discoloration and tumor, is an important point in diagnosis.

The only case I have seen that might on superficial examination have been confused with suprarenal hemorrhage was a case of hemorrhage into the pleural cavity of an infant, aged 4 days. A rib resection was performed and a transfusion was given the same time, with recovery.

Not one of my patients had fever. This is in marked contrast to the cases described by Goldzieher and Greenwald,[11] who gave hyperpyrexia as one of the chief symptoms.

The lack of complete studies on the blood in the cases reported here is due partly to the necessity for speed in treating these patients (as was shown in case 4) and partly to the inability to get blood from an exsanguinated infant at the time of transfusion.

I feel that these cases require immediate transfusion. It is difficult to see how the use of cortical hormone, no matter how potent could stop the hemorrhage or alleviate the exsanguination. None of my patients showed anything which in the light of the present investigation could possibly be described as due to acute hormone deficiency, unless it were the asthenia, and that, I believe, is caused by the anemia, for it is relieved at once by transfusion.

NOTE.—Since this report has been made a case has occurred at the Buffalo Children's Hospital, in which the foregoing syndrome was duplicated. A diagnosis of cerebral hemorrhage was made. At autopsy the head was normal and there was a massive suprarenal hemorrhage with rupture. I cannot but feel that many of these cases are diagnosed wrongly, and that the patients die because of the lack of proper treatment.

11. Goldzieher, M. A., and Greenwald, H. M.: Hemorrhage of the Suprarenals in the New-Born Infant: Diagnosis and Therapy, Am. J. Dis. Child. **36**:1324 (Aug.) 1928.

THROMBOSIS OF THE DURA MATER SINUSES FROM JUGULAR ENDOPHLEBITIS

SEQUELAE OF PARATRACHEAL ABSCESS WITH AUTOPSY *

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History.—Moe W., aged 2½ years, was admitted to Beth Israel Hospital Feb. 3, 1930. The family history was unimportant. Two older children were well, although somewhat pale. The patient was born at full term after normal labor, and he was normal at birth. He was nursed for the first four and a half months and thereafter was bottle fed. He was always a poor eater, but nausea or vomiting never developed, although he was constipated. Two weeks before admission, there appeared on the left side of the neck a painful and tender swelling, which, however, slowly subsided. In the interval the temperature ranged from 101 to 103 F. Three days before admission he had generalized convulsions, and thereafter became more and more drowsy, until he could no longer be aroused from his stuporous state. Before reaching this state he had often awakened from his sleep screaming. There were total anorexia, slight cough and frequent micturition.

Physical Examination.—The child was well developed, but he was extremely pale and ill, and did not respond to the mother or physician. At times Cheyne-Stokes breathing was noted. The scalp was normal, and the pupils were equal in size, widely dilated and sluggish in their reaction to light. The nose and ears were free from discharge, the tongue dry and coated, the pharynx congested. The tonsils were enlarged but not inflamed, and digital exploration revealed no swelling behind them. At the left side of the neck in the anterior triangle there was a large mass which was neither red nor tender, but which had a hard, nodular consistency, suggesting enlarged lymph nodes. Some hard, small lymph nodes could be palpated on the right side. There was some rigidity of the neck. The heart was normal, and there were many coarse râles over the lungs.

The spine was somewhat rigid, and there was slight intermittent opisthotonos. The abdominal reflexes were absent. The abdomen was free from distention, tenderness and rigidity, and there were no masses; the liver and spleen were not palpable. The upper extremities were normal. There was a slight positive bilateral Kernig, and a positive Brudzinski, sign. No knee jerks could be elicited. An ear, nose and throat specialist who examined the child on two occasions could find nothing wrong. The ears were normal, and no mass could be felt in the retropharynx. The examination of the eye grounds, which was difficult, revealed pallor of the disks with ill defined contours, papilledema and secondary optic neuritis. Three days after admission tremors of the left upper extremity and of both lower extremities developed. Kernig's sign became more marked, and a right-sided Babinski sign appeared. During this period the temperature ranged from 101 to 104 F., but on the sixth day before the patient's death it went up to 107 F. The urine contained faint traces of albumin. The blood count was as

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* From the Department of Pediatrics of the Beth Israel Hospital.

follows: red cells, 3,320,000; white cells, 24,400; polymorphonuclears, 87 per cent; lymphocytes, 12 per cent, and staffs, 17 per cent. (A staff form is the only immature neutrophylic granulocyte present in the bone marrow that normally appears in the blood stream in the amount of from 3 to 5 per cent.) Plasma cells and myelocytes were almost absent. Anisocytosis, poikilocytosis, macrocytosis, microcytosis and polychromatophilia were marked. On puncture the spinal fluid did not issue under high pressure; it was clear and on standing formed a fine fibrin coagulum. There was a cell count of 16 with 90 per cent lymphocytes. Albumin, globulin and sugar were present. On two examinations no bacteria were found, and a culture of the blood gave negative results. Roentgenograms of the neck and chest were negative, save for a slight thickening of the parietal pleura of the right lung.

Necropsy Report.—The following notes are extracted from Dr. Alfred Plaut's necropsy record made Feb. 9, 1930.

The body was that of a child of 2½ years with extensive rigor mortis. The skin was pale and dry; there was loss of subcutaneous fat, but nothing abnormal was found until the skin was separated from the underlying tissues of the neck; then there was a gush of yellowish-green, creamy material from the left paratracheal region. On careful dissection a clearly defined abscess cavity was found, extending from the angle of the jaw downward to about the level of the fifth cervical vertebra. The outer wall of the abscess cavity consisted of cervical muscles, while the posterior wall was made up of the deep cervical glands, retropharyngeal glands and the outer wall of the pharynx. The left internal jugular vein in its entire extent was dark red within with some irregular yellowish-gray rough spots. At about the height of the bifurcation, the vein was surrounded by brittle yellow masses.

Nothing abnormal was encountered on opening the thoracic and abdominal cavities.

When the cranium was opened marked alterations were found in the vertex. All of the sinuses over the entire left half of the brain were distended and tortuous. The entire sagittal sinus from the foramen cecum to the torcular was occupied by an extensive thrombus, which was largely dark red, although yellowish in parts. In some places it was hard and adhered to the wall, while in others it was soft and creamy and of a light reddish color. The same extensive thrombus could also be seen throughout the lateral, occipital, straight and inferior longitudinal sinuses; the superior and inferior petrosal sinuses; the vena galeni, and the transverse, circular and cavernous sinuses of the left side. In addition, both the superficial and the deep veins of the vertex were involved in the thrombosis. There was an extensive hemorrhage over the convexity of the brain at the left frontal lobe. Here the brain was soft and friable, and the hemorrhage extended for a few millimeters into the substance of the cortex.

There were also various minute hemorrhages, both in the surface and in cut sections of the cortex, but there was no suggestion of meningitis in any of the membranes. Sections below the level of the corpus callosum showed extensive distention and thrombosis of the deep cerebral veins. The straight sinus stood out prominently, with a dark red thrombus stuck in it like a cork. The choroid plexus was notably edematous and hemorrhagic. The entire thrombotic process appeared to have originated in the internal jugular vein and extended from the lateral sinus as far as the torcular Herophili; from there it spread along the superior longitudinal sinus, and thence by way of the straight sinus to the inferior longitudinal. Again from the lateral sinus the superior petrosal, the circular, the transverse, and the cavernous sinuses were involved.

General observations were anemia and a tendency to enlarged lymph nodes throughout the body. The hemolytic streptococcus was cultivated from the abscess. The thrombosed veins at different levels were submitted to microscopic examination. The wall of the internal jugular showed phlebitis, and the coats of the veins were indistinguishable. The large adherent thrombus in the vein consisted of fibrin with many irregularly-shaped nuclei. Between the thrombus and wall of the vessel there was a thin layer of granulation tissue with elongated nuclei. Observations in the smaller veins were of the same character. The arteries that accompanied the thrombosed vessels were normal.

Microscopic Diagnosis.—The following microscopic diagnosis was made: paratracheal abscess due to *Streptococcus hemolyticus*, thrombosis of the left jugular vein, thrombosis of the dural sinuses, large hemorrhage in the soft meninges, multiple cerebral hemorrhage, notably in the basal ganglions, swelling of lymph nodes and anemia.

COMMENT

In looking up the literature of this case, I find that so far as published reports are concerned, it is unusual in several respects. (1) The internal jugular vein was directly infected from a cervical abscess. (2) In place of the development of septicemia or septicopyemia from absorption of infectious material into the general circulation, the patient suffered from a general thrombophlebitis of the cerebral veins and sinuses. (3) A feature that may make the case stand out is the age of the subject, for the few similar cases that I have been able to find occurred in adults.

Of course it is understood that sinus thrombosis is common as a complication of diseases of the ear, and that many cases also originate in foci of suppuration in the region of the head and face and the cavities of this region. But infection of a large venous trunk from direct contact with an abscess is entirely different.

Dr. Charles Goodman[1] reported a case that occurred in his service at the Beth Israel Hospital. The patient was a woman aged 35 who had recently had an attack of follicular tonsillitis, from which she had seemingly recovered. Five days before admission, a picture of sepsis, with chills, profuse sweats and a temperature of 104 F. developed. Cultures of the blood gave negative results, and the craniofacial cavities examined by Dr. Kopetzky were all normal, save for a reddened pharynx. An indurated mass was found on the left side of the neck along the anterior border of the sternomastoid. The diagnosis was septic thrombophlebitis, and Dr. Goodman at once cut down on the internal jugular with the aim of resection. The vein was surrounded by inflammatory tissue; it was thrombosed at the level of the facial tributary, which was itself somewhat implicated. Dr. Goodman resected the thrombosed vessels, and the patient made a good recovery.

1. Goodman, C.: Primary Jugular Thrombosis Due to Tonsil Infection, Ann. Otol. Rhin. & Laryng. **26**:527 (June) 1917.

The rationale of this case was presumably as follows: During the follicular tonsillitis a lymphatic infection developed, and the deep lymph nodes formed the starting point of a local metastasis. There is no mention of a collection of pus in this case. Dr. Goodman searched the literature for analogous cases, but without much success. The only case mentioned by him in this connection is that of Long,[2] whose patient had first suffered from a streptococcic sore throat. The internal jugular vein had been directly infected by contiguity.

Dr. Mosher,[3] of the Massachusetts General Hospital, reported a case which he regarded as akin to Goodman's. The patient was a man, aged 26, who had been admitted to the hospital with general septicemia; the case was, therefore, already advanced when seen by Dr. Mosher. In all probability the septicemia had resulted from a retropharyngeal abscess. Mosher found a small mass at the site of this abscess and reproached himself that he had not opened and drained it. This recurrent abscess grew worse and was pointing externally in the neck when haste was made to cut down on the internal jugular. A large amount of foul pus drained following the incision, and the vein was found to be completely destroyed. Death soon followed. Autopsy was refused.

Hastings[4] quoted the cases of Goodman and Mosher as the only ones reported in recent literature that in any way resembled this type of thrombosis. Dr. Mosher quotes Goodman's case, already given, and apparently found no other. He believed, however, that such cases may readily be overlooked and gives from memory some notes of a case that he thinks may have been of the same character.

The patient was a man of 38, whose health had been good for years, although he had probably suffered in earlier life from tuberculous manifestations. At first a soreness in the left side of the neck developed, and there were only subjective symptoms. No general reaction occurred. Examination for a primary focus of infection in the throat and ear gave negative results. At a later period symptoms suggestive of sepsis developed, and the process appeared in the opposite side of the neck. This picture of sepsis was confused through the development of an acute hemorrhagic nephritis, which was probably one of a number of embolic metastases. The regional diagnosis was that of a deep-seated cervical abscess originating in infected lymph nodes. Examination of the veins showed that the large trunks were free from throm-

2. Long, J. W.: Excision of Internal Jugular Vein, Surg. Gynec. Obst. **14**: 86 (Jan.) 1912.

3. Mosher, H. P.: Deep Cervical Abscess and Thrombosis of the Internal Jugular Vein, Laryngoscope **30**:365 (June) 1920.

4. Hastings, H.: Bilateral Jugular Resection for Bilateral Sigmoid Sinus Thrombosis (Otitic), Arch. Otolaryng. **4**:58 (July) 1926; Tr. Sect. Laryng. Otol. & Rhin., A. M. A., 1926, p. 202.

bosis, but that there was evidently thrombophlebitis of the superior thyroid vein which did not extend to the internal jugular. There seemed to be no indication to cut into the neck, and the picture of general sepsis and acute nephritis developed promptly, followed by death. Autopsy was not permitted. The author suggested a pyogenic infection of tuberculous lymph nodes.

Recently many cases of malignant sore throat with fatal septicopyemia have been reported in German journals. I recall reading of one of these cases in which abscess of the neck and anterior mediastinum may have been responsible for direct implication of the internal jugular with thrombophlebitis and pyemia. It is not unlikely that a careful study of clinical cases under various titles would bring to light material which escaped being recorded under the proper classification.

ACUTE HEMOLYTIC ANEMIA IN CHILDHOOD*

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In 1925, Lederer [1] first called attention to a form of acute, rapidly progressive anemia, accompanied by fever, general weakness, marked pallor and splenic and hepatic enlargement, with severe leukocytosis and erythroblastemia. Another striking characteristic of the picture was the rapid, permanent recovery to normal, following a transfusion of whole blood. The recovery not only demonstrated itself clinically by the general improvement of the patient, but also in the return of a normal hematologic picture.

In the literature, one finds similar cases reported by Brill,[2] Steffens,[3] and Benhamou, Jude and Gill.[4] Krumbhaar,[5] Osler,[6] and Elsner [7] referred to forms of acute pernicious anemia, which somewhat resemble this type, but which are secondary to other conditions, including syphilis. More recently, Holst,[8] and Christiansen [9] reported two typical cases, both believing that this entity bore no relationship to pernicious anemia. Christiansen was unable to demonstrate any therapeutic effect of liver therapy. Lederer,[10] in his last analysis, was able to obtain reports of only twelve cases in the literature.

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* From the Pediatric Department of the Bushwick Hospital and Kingston Avenue Hospital for Contagious Diseases.

1. Lederer, Max: A Form of Acute Hemolytic Anemia, Am. J. Med. Sc. **170**:500 (Oct.) 1925.

2. Brill, I. C.: Acute Febrile Anemia, Arch. Int. Med. **37**:244 (Feb.) 1926.

3. Steffens, L. A.: Acute Febrile Anemia, Minnesota Med. **11**:412, 1928.

4. Benhamou; Jude and Gill: Anémie febrile aigue, Presse méd. **36**:794, 1928.

5. Krumbhaar, E. B.: Leukemoid Blood Pictures in Various Clinical Conditions, Am. J. M. Sc. **172**:519, 1926.

6. Osler, W.: Practice of Medicine, ed. 5, New York, D. Appleton & Company, 1904, p. 797.

7. Elsner, H. L.: Monographic Medicine, New York, D. Appleton & Company, 1916, vol. 6, p. 524.

8. Holst, P. F.: Sur les anémies hémolytiques non registrables, Acta med. Scandinav. **27**:469, suppl. 23, 1928.

9. Christiansen, T.: Et bidrag til Lederer-anaemiens klinik, Hospitalstid. **72**: 178, 1929.

10. Lederer, Max: Acute Hemolytic Anemia Probably of Infectious Origin, Am. J. M. Sc. **179**: 1930.

REPORT OF CASES

CASE 1.—*History.*—R. G., a colored schoolgirl, aged 11, was born in Tennessee, but for the past five years had been a resident of New York. She was admitted to the pediatric service of the Bushwick Hospital on Jan. 4, 1927. The history began ten days before admission, with sudden nonprojectile vomiting. She complained of pain and tenderness in the upper right epigastric region. Vomiting stopped three days later, but malaise, prostration and pallor became so alarming that the mother called a local physician who advised hospitalization.

The family and past history were irrelevant, except that the child had had uncomplicated measles and scarlet fever during her seventh year. She also had pneumonia at 8 years of age; otherwise she had been unusually healthy.

Examination.—The physical examination on admission revealed a poorly nourished child, acutely ill, with signs of marked dyspnea, air hunger, severe pallor of all membranes and prostration. She was apparently on the verge of coma. The temperature was 102 F.; the respiration, 60, and the pulse rate, 140. There was a marked acidotic odor to the breath. Except for the washed-out appearance of the membranes throughout the body, no rashes, petechia or edema were noted. The pupils of the eyes were dilated, but they reacted to light and in accommodation. The disks were especially prominent, in view of the surrounding pale retina, and stood out prominently in the examination of the eyegrounds. None of the coats of the eye revealed hemorrhages of any kind. The rest of the general examination revealed the following objective symptoms: enlarged cervical nodes, marked bilateral jugular pulsations, supraclavicular retraction and slight rigidity of the neck. All the intercostal spaces appeared retracted with inspiration, the child using its accessory muscles of respiration. Breathing was labored, and moist râles could be heard at the bases of both lungs. Percussion revealed that the heart was enlarged to both right and left, the apex being 3 cm. outside the midclavicular line in the sixth interspace. A systolic murmur could be heard over all of the precordium, and it was loudest at the base. The abdomen was not distended, but tenderness and resistance to touch were present, especially in the right upper quadrant. On account of the voluntary spasticity of the abdominal muscles, the liver and spleen were not palpable at this time. There was general muscular tenderness over the entire body. An examination of the extremities, the nervous system, the external sex organs, and the rectum revealed nothing of diagnostic importance. The blood picture on admission showed: erythrocytes, 650,000 per cubic centimeter; hemoglobin, 25 per cent (Sahli); leukocytes, 108,000; polymorphonuclear neutrophils, 34 per cent; lymphocytes, 41 per cent; myelocytes, 16 per cent, and unclassified, 9 per cent. Twelve hours later, the examination of the blood showed: erythrocytes, 520,000; hemoglobin, 18 per cent (Sahli); leukocytes, 97,000; polymorphonuclear neutrophils, 38 per cent; lymphocytes, 43 per cent; myelocytes, 18 per cent, and unclassified, 1 per cent. In both specimens, there was marked poikilocytosis, anisocytosis and many nucleated red cells.

Course and Treatment.—On the day following admission to the hospital, the child was given a transfusion of 400 cc. of unmodified blood from the father, with marked improvement in the pallor and general condition. Within the next twenty-four hours, the dyspnea, irregular breathing and hyperesthetic condition subsided. The temperature rose to 100 F., the pulse to 140, and the respiration to 40, but following a sponge bath, these factors became normal within twenty-four hours following the transfusion, and remained normal until the patient was discharged. The spleen now became palpable at 2 cm. below the free border of the ribs, and the liver was felt at 3 cm. below the margin of the rib. These organs gradually

became larger during the next week, the spleen reaching for 5 cm. and the liver for 6 cm. below the ribs. These organs rapidly decreased in size during the next week and were finally nonpalpable before the patient's discharge from the hospital. The cardiac murmur, the pallor, the prostration, the rigidity of the neck and the air hunger disappeared shortly after the transfusion. The child at no time showed icterus. Beside the transfusion, no special treatment or medication was given, except that the diet was increased in red meats and green vegetables. She was discharged as well from the hospital on Feb. 9, 1927, thirty-six days after admission.

Laboratory Data.—Beside the studies of the blood, which are charted separately, the following procedures were performed to find a possible etiologic factor.

Observations on the Blood in Acute Hemolytic Anemia

Case 1

Date	Red Blood Cells	Hemoglobin, per Cent	White Blood Cells	Polymorphonuclears	Lymphocytes, per Cent	Myelocytes, per Cent	Unclassified	Normoblasts	Megaloblasts, per Cent	Anisocytosis	Poikilocytosis	Platelets
1/ 4/27	650,000	25	108,000	34	41	16	9	Many	..	+ + + +	+ + + +	.....
1/ 5/27	520,000	18	97,000	38	43	18	1	Many	..	+ + + +	+ + + +	303,000*
1/ 8/27	2,000,000	55	35,000	60	14	22	4	.....	..	+ +	+ + †	
1/11/27	2,500,000	60	25,600	56	24	19	1	.....	..	+	+	
1/17/27	.....	..	21,800	71	14	15						
1/20/27	.....	..	19,500	80	7	13						
1/22/27	.....	..	18,600	83	6	11						
1/31/27	2,820,000	60	22,500	71	20	9						
2/ 9/27	3,500,000	75	15,200	68	22	10						
3/15/27	2,400,000	60	12,400	80	15	..	5					
9/27/27	2,500,000	65	17,800	90	10‡							
3/24/28	2,800,000	68	11,000	62	27	..	1					

Case 2

				Small	Large							
4/14/29	1,500,000	15	76,000	76	7	15	..	2	27%	13	+ + + +	263,000
4/15/29	2,670,000	40	11,600	60	25	10	..	5	.....	5	+	300,000†
4/17/29	3,670,000	50	22,700	75	20	15						
5/ 2/29	2,670,000	60	13,600	70	20	10						
7/13/29	2,750,000	65	9,450	68	25	5	..	2	.....	..	.....	260,000

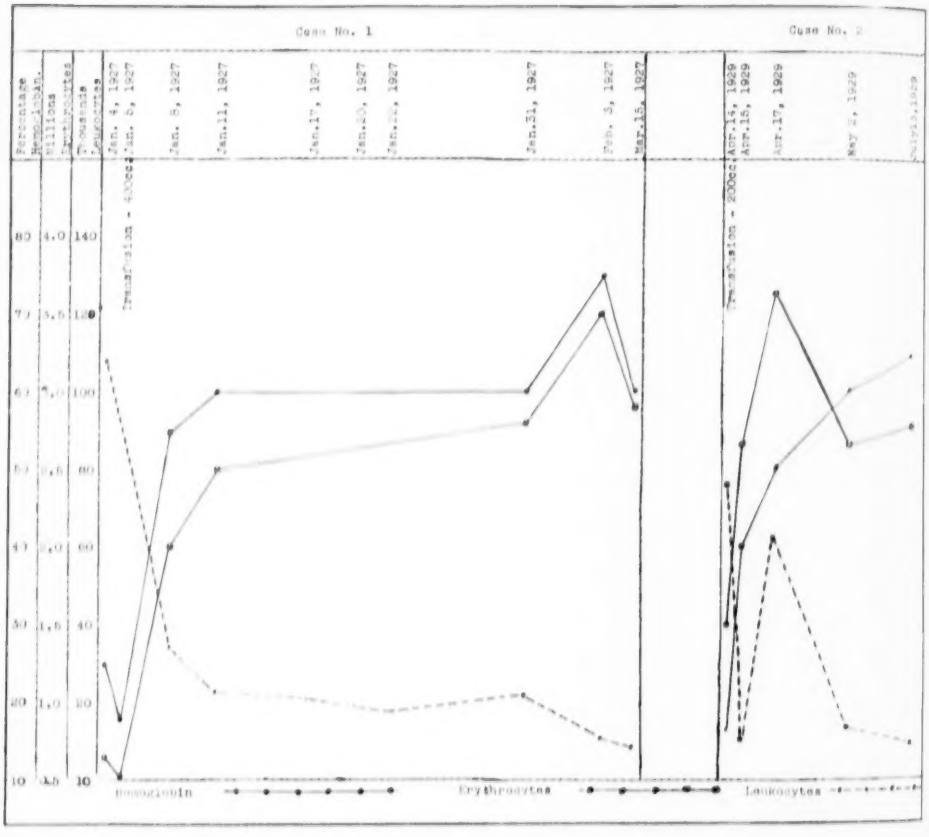
* Before transfusion.
† After transfusion.
‡ During pneumonia.

Two Wassermann and Kahn tests of the blood gave negative results. Two cultures of the blood were sterile. The urine showed a trace of albumin and marked acetone that disappeared after transfusion. Urobilin and direct van den Bergh tests were negative. The stools showed no blood, bile ova or parasites. The injection intradermally of 0.1 mg. of tuberculin gave a positive reaction. The roentgenogram of the chest showed enlarged hilar glands with some cardiac dilatation.

Subsequent History.—One month after discharge from the hospital, the child developed a bilateral parotitis, with a return of the systolic murmur at the base of the heart. The liver became just palpable, but the blood picture remained normal. Six months following parotitis, the child contracted pneumonia of the right lobe complicated by serous pleuritis. Recovery occurred in four weeks. Except for the usual leukocytosis and a polymorphonucleosis, which returned to normal, nothing abnormal was noted in the blood. During this illness, the liver and spleen were never palpable.

CASE 2.—*History.*—N. W., a Negro girl, aged 4, born in New York, was admitted to the service of Dr. Lee W. Thomas at the Kingston Avenue Hospital for Contagious Diseases. The child gave a history of having been taken ill four days before admission, with vomiting, followed by extreme pallor, prostration, general muscular tenderness, rigidity of the neck, severe headache and backache. The child became rapidly worse, and was sent to hospital by the local physician.

The family history was of no consequence, except that the child had had measles one year previously.



Blood picture in two cases of acute hemolytic anemia.

Examination.—Physical examination on admission showed a markedly sick child in semicomatose condition with her legs and arms held constantly in a flexed position. She resisted examination, and appeared extremely toxic and pale. Rapid dyspneic type of breathing, air hunger and marked prostration were also noted. The temperature was 104 F., the pulse rate, 156, and the respiration, 60. The conjunctiva of the eyes showed marked pallor, and the eyegrounds showed a similar depletion of red color. No hemorrhages were noted. The upper respiratory tract showed rhinopharyngitis beside pallor of the membranes. The anterior cervical nodes of the neck were slightly enlarged, and there was marked pulsations of the blood vessels and prominence of the accessory muscles of respira-

tion in the neck. On account of the voluntary rigidity of the neck, the child was suspected of having meningitis. The breathing was forced, rapid and dyspneic. The lungs showed no râles or other adventitious sounds. Percussion showed enlargement of the heart both to the right and to the left side, and a systolic murmur was heard at the base. The liver and spleen were not palpated at the time on account of the general tenderness of the abdomen and the patient's resistance to touch. The skin showed no edema or hemorrhages. Except for a suggestive bilateral Babinski reflex, the examination gave negative results. The impression at this time was that the child had atypical anemia with meningismus. A study of the blood on admission showed: erythrocytes, 1,500,000; hemoglobin, 15 per cent (Sahli); color index, 0.5; platelets, 263,000; leukocytes, 76,000; polymorphonuclear neutrophils, 76 per cent; small lymphocytes, 7 per cent; large lymphocytes, 15 per cent; unclassified cells, 2 per cent; normoblasts, 27 per cent, and megaloblasts, 13 per cent. Marked anicytosis, poikilocytosis and polychromia were noted.

Course.—On the day after admission, the child was given 200 cc. of unmodified blood from the father with immediate improvement. As in case 1, the pallor, dyspnea, prostration and headache were immediately improved. The next day, the pains in the body were less, and the liver and the spleen were palpated and showed enlargement. During her stay of two weeks in the hospital, the rigidity of the neck, the cardiac murmur and the pallor disappeared entirely. Icterus was never noted. The liver and spleen also became nonpalpable before discharge from hospital.

Laboratory Data.—The Wassermann and Kahn tests of the blood on the parents and on the child were negative. Cultures of the blood were sterile twice. A series of intradermal injections of tuberculin gave negative results. Cultures from the nose and throat were negative for diphtheria bacilli. Two spinal taps showed only a slight increase in protein, otherwise they gave normal results. Examinations of the urine were repeatedly negative. Urobilin was absent, and a pooled specimen of urine failed to reveal any lead. Vaginal smears and gonorrheal fixation tests were negative for gonococci. Roentgenograms of all the bones of the body revealed no pathologic conditions. The chest showed cardiac dilatation with peribronchial infiltration and evidence of possible thickening of the pleura on the left side. The feces showed no blood, ova or parasites.

COMMENT

In reviewing the literature of pediatrics, one finds no direct reference to this entity, although these cases are probably seen and described as acute atypical anemias. Clinically, the picture is so alarming, rapid and severe, that it indelibly impresses one, and the dyspneic breathing and air hunger especially simulate the picture of severe poisoning. Even patients with acute hemorrhage do not present this striking picture. The marked progressive anemia, the general tenderness of the body, the fever, the increased pulse and respiration rates, the suggestive abdominal symptoms, such as vomiting and the tenderness of the abdomen accompanied by splenic and hepatic enlargement, are the cardinal symptoms. Peculiarly, in both cases, the liver and spleen were not palpable before transfusion, possibly due to the voluntary rigidity of the abdomen, caused by muscular tenderness, and they definitely

increased in size after this procedure. The initial blood picture before transfusion is suggestive of severe leukanemia.

The most striking feature of this entire condition is the rapid recovery, judged by clinical symptoms and improvement of the blood picture following transfusion of whole blood. All the cellular elements of the blood rapidly assumed a normal picture and the abnormal elements such as nucleated red cells and megaloblasts disappeared. No icterus was noted in these cases.

In the cases thus far reported, the ages range from 6 months to 35 years, about 30 per cent occurring in childhood, these cases being more rapid and severe than those in the adult.

Etiologically, nothing has been found as a specific cause, although an infectious origin has been suggested by some authors. Subsequent infections do not cause a return of the syndrome.

SUMMARY

Two cases of acute hemolytic anemia in children are presented, showing a clinical picture characterized by a severe, rapid, progressive leukanemia, with signs of approaching coma, air hunger, prostration, general hyperesthesia, high temperature, rapid pulse and rapid respiration, and splenic and hepatic enlargement.

Recovery follows rapidly after a transfusion of unmodified blood.

Recurrence after future infections is not noted.

847 Lincoln Place.

Progress in Pediatrics

AN EARLY CASE OF PYLORIC STENOSIS*

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It was William Osler who first aroused interest in the history of pyloric stenosis with his reprint of a report of a case by Hezekiah Beardsley. In 1788, Beardsley reported to the Medical Society of New Haven County "A Case of Scirrus in the Pylorus of an Infant." It is the first contribution to the history of this disease in America.

In 1771 George Armstrong of London published a second edition of his "Essay on the Diseases most Fatal to Infants." In this book is found an accurate description of the disease. Dr. John A. Foote[1] of Washington gave an account of Armstrong and the report of his case, which has been accepted as the first mention of the disease in medical literature. More recently, Dr. G. F. Still of London found a case reported by Christopher Weber in 1758.

In 1717 Patrick Blair reported to the Royal Society of London a clinical history and autopsy record of a pediatric case. I shall present this as a case of pyloric stenosis, recorded fifty-four years before Armstrong's book was published. It is probably the earliest description of the disease on record.

An Account of the Dissection of a Child[2]

As nothing is more apt to lead us to the Knowledge of the several Distempers which affect the Human Body, and to acquaint us with the just Prognosticks of the like Cases, than the opening of distemper'd Persons. I hop'd it would not be an unacceptable instance of my Zeal and Readiness to serve the Most Honourable the Royal Society upon all occasions, to desire you to present them with the following account of the Dissection I lately made of a Child.

This Child was five Months old, and was so emaciated, that he appear'd rather to have decreased, than to have encreased in Bulk, from the time of his Birth; his whole Body not weighing above five Pounds. The Skin and Muscles of the Abdomen were very thin, but the Peritoneum was preternaturally thick. The Ventriculus was more like to an Intestin than to a Stomach, its length being five Inches, and its breadth but one Inch. The coats of it were thick and fleshy, and the Cavity very inconsiderable. The Pylorus, and almost half of the Duodenum were cartilaginous, and something inclin'd to an Ossification, so that no Nourish-

* Submitted for publication, July 2, 1930.

1. Foote, John A.: The Earliest Report of Congenital Pyloric Stenosis, Am. J. Dis. Child. **33**:294 (Feb.) 1927.

2. Communicated in a letter to Dr. Brook Taylor, R.S., Secr.

ment could have passed into the Intestins, tho' the Stomach had been capable of containing it, which makes it no wonder that the Body was so emaciated. There was scarce any footsteps of the Omentum to be seen, even at the Bottom of the Stomach, to which it usually adheres.

The right Lobe of the Lungs adhered firmly to the Ribs and had three Exulcerations, which contain'd purulent Matter. It was so very thin and compact, that it seem'd as if that Lobe had never been of use in Respiration. The left Lobe was of a more florid Red, spongy, and free from any Adhesion.

Upon enquiring after the symptoms this Child had been affected with, his Mother told me, he seem'd to be healthy till he was about a Month old, when he was seized with a violent Vomiting, and a Stoppage of Urine and Stool. Some time after, both these became more regular, but the Vomiting still continued. He seem'd to have a great Appetite, taking what Suck, Drink, or other Food was offer'd him, with a kind of eagerness; but he immediately threw it all up again. He had all along breathed freely, and had no Cough, notwithstanding the Exulcerations above mention'd. This confirm'd me in the Opinion that he had never Breath'd, by the right Lobe of the Lungs.

There could be nothing more emaciated than this Child was; and it seems to be worth considering, whether his Illness might not be owing in a great measure to the want of the Omentum, (for he seem'd never to have had any); as also, whence it is that this Part is generally consum'd in an Atrophy, and in most Hydropical Cases, except where it self is more especially concerned.—*Dr. Patrick Blair, R.S.S., Phil. Tr. no. 353, p. 631.*

The standard works on biography contain a short stereotyped account of Patrick Blair, evidently taken from the original account given by William Pulteney in 1790. From this one gathers that his fame rests chiefly on his contributions to botany. He was one of the first to appreciate the importance of the sexes of plants, and although he was not the discoverer of this phenomenon, he deserves credit for having lent weight in the support of the doctrine and for making it popular among the scientific men of the period. In addition to these short notes, there is some other material, chiefly letters, which give an account of the man and his contributions to medicine and science. Nothing is known of his birth or early life, and he is first heard of as a successful surgeon and practitioner in Dundee and the surrounding country in Scotland. There is every reason to believe that he was a man of considerable parts and was held in high esteem by his townspeople and contemporaries.

If this emaciated child had pyloric stenosis, Blair deserves a more lasting place in history. Although the necessary details for a complete biography are lacking, the defect can be compensated for to some extent by relating some interesting occurrences in his eventful life.

About 1690 he became interested in pediatrics and was particularly concerned in a study of the manifestations and cure of rickets:

. . . And as I have had several Years Experience in the Diseases of Children, and applied my self particularly to that Part of the Practice of Physick, so I never yet observ'd that if the Nurse was careful to keep the Child clean, if it receiv'd a moderate Dyet, at seasonable Times of the Day, and was plung'd into

cold Water every morning, being well dried and rubbed down afterwards, that such a Child was thereafter affected with the Rickets.

To improve himself further in his profession, he spent the years from 1694 to 1697 studying in the low countries of Europe.

On April 27, 1706, an elephant died at Dundee in Scotland. The death of the elephant was an important event in the life of Patrick Blair, surgeon. Men had been interested in oteology for many years, and even at this time comparative anatomy was a fruitful subject for discussion, so that the bones and parts of an elephant afforded Mr. Blair a wealth of material for publication. On account of the heat, he made a precipitate dissection, mounted the skeleton and put it in the public hall for rarities at Dundee. He then collected a vast amount of material concerning elephants, biblical and otherwise, and presented it in a letter to the Royal Society at London in 1710. Blair's fame as an anatomist was established. "Osteographia Elephantina" was later published in a quarto volume. It was a good piece of work, replete in all details concerning elephants, the habits, span of life, methods of procreation, methods of capture and taming, memory, faithfulness, etc. But there is a good deal of folk-lore mixed with sound description. One gets a trifle bored with the exact weight of all the bones and the methods of mounting the skeleton (there are about 100 pages in abstract), and one is satisfied that a pair of elephants did not die at Dundee in 1706.

During the period from 1707 to 1715, Blair was living in Dundee (later in Cowpar of Angus) and carried on a correspondence with some of London's famous scientists and physicians. To Dr. Hans Sloane he sent some observations on uterine polyps, fistula in ano and cystic tumors. To James Petiver, a leading botanist, he communicated some of his ideas on plants and their pharmacologic actions. He mentioned a case of poisoning by *Hyoscyamus*, and also described some new species. Two rather important letters to Richard Mead concerned observations on poisoning by arsenic and epidemics in Scotland. As one of these is mainly pediatric, an excerpt is given:

. . . We have likewise every fourth or fifth Year the small Pox, Measles, &c. which prove Epidemical; but the great Advantage is, that Children with us (for the most part) have them before they are seven or eight Years of Age; whereas I understand that in England few have the small Pox till they be Men and Women. They are some Years more dangerous and sweep away a great many children, and others more favorable. . . . The Tussis Convulsiva or Chink-cough, is also some Years Epidemical, and becomes universal among Children; as is a certain Distemper with us, called the Croops, with this Variety, that whereas the Chink-cough encreases gradually is of a long Continuance, seizes in Paroxysmes, and the Patient is well in the Interval. This Convulsion of the Larinx as it begins so it continues, so violently, that unless the Child be relieved in a few Hours, 'tis carried off within twenty four, or at most forty eight Hours. When they are seized they have a terrible Snorting at the Nose,

and squeeking in the Throat, without the least Minute of free Breathing, and that all of a sudden, when perhaps the Child was but a little time before healthful and well. The most immediate Cure is instant Bleeding at the Jugular, either by the Launcet or Leeches; when the most urgent Symptoms are gone, then Emeticks, or the like, are administered at Discretion.

This acquaintance with the leaders of scientific thought in London, greatly strengthened by his letter on the anatomy of the elephant, was to be of great service to Blair in a later period when his life was in peril.

There can be little doubt that the elephant's demise played another important rôle in his life, for shortly after his work became known, Patrick Blair "Apothecary in Coupar Angus, who had been recommended by the Bishop of Aberdeen and several eminent physicians in Angus" received the honorary degree of Doctor of Medicine from King's College, Aberdeen, on May 29, 1712.[3]

Except for a short account of asbestos as it was found in Scotland, no more is heard about Blair until the rising of 1715.

When Queen Anne died on Aug. 1, 1714, the average Englishman accepted the fact that the crown would pass to the "high and mighty Prince George, elector of Brunswick Lüneburg." But that event meant considerably more to the people of Scotland, for they had an undying affection for the Stuart family. Ever since the revolution in 1688, they had harbored a suppressed desire to see one of the Stuarts on the throne of England. So when John Erskine, Earl of Mar, decided for himself that the time was ripe for a rebellion, he found the Highlanders ready. For they were always ready to fight, either for or against the king. The Lowlanders were a little more difficult to arouse. Patrick Blair himself was reluctant to go to war. He enjoyed a large and happy practice and was considered the surgeon with the oldest experience in that country. But when he found that his practice had dwindled owing to the troubled times, and, more particularly, when he was unable to collect what was owing to him, it became increasingly difficult to support himself and his small family. He was threatened with taxes which he was unable to pay, and finally, under protest, he joined the service as surgeon to one of the regiments under Lord Nairn. There were English troops at Stirling and English ships along the coast, and the "honest men" had difficulty in attempting to cross the Forth on their way to England. Patrick Blair decided to go back home. There he stayed until he learned that the surgeon belonging to the other regiment had been captured. He was then ordered to rejoin his regiment and serve as surgeon for all the infantry that was marching to England. The army had a notion that it would be rather nice to have a physician and surgeon, much to Blair's disgust.

3. Aberdeen University Records, through the kindness of W. D. Simpson, librarian.

After crossing the Firth of Forth under perilous circumstances, they landed near North Berwick, and after an unsuccessful attempt to attack at Edinburgh, proceeded to Dunse, Kelso, Jedburgh and Hawick. They hesitated at the border, unwilling to go into England, but the promise of aid from the English border counties encouraged them on to Longtown, Lancaster and Preston. The conquest of England seemed so very easy, and, having met with little or no resistance they stopped at Preston to drink a dish of tea with the ladies of the town. They feasted and caroused. They sang about James Edward, "their lawful sovereign, by the grace of God, King of Scotland, England, France, and Ireland, Defender of the Faith etc." They drank a toast to his health. Meanwhile, however, the English had left Wigan, and, proceeding cautiously, approached the outskirts of the town. At the same time a detachment under Carpenter had pursued them from the north, and the little band of insurgents awoke to find themselves surrounded. Many escaped, but most of them were captured, but not without an exchange of sharpshooting. Some of the prisoners were tried and put to death. Others were sent to Liverpool to be tried, sentenced or transported to the colonies; transportation to America was considered the next worst thing to capital punishment. But the leaders were marched to London, and Patrick Blair was considered enough of a prize to be taken along. Humiliated by cries and shouts of "Down with the Pretender," they were ushered to the Tower and Newgate. Blair spent many an anxious hour at Newgate, but not without making some efforts to gain his freedom. He wrote to many of his friends—to Petiver, Mead and others—but with little prospects of advantage. At length, on July 7, 1716, the death warrant of twenty-five of the prisoners was signed. There was no time now for reverie. He wrote to Sir Hans Sloane:

Dear Sir

There is at least an human period put to my life, which is to terminate on Friday next (as an signed warrant intimated to me this day do's declare) unless the providence of Almighty God and the great endeavors of such worthy friends as you are do prevent it. I am abundantly sensible of your great wishes, and want only to see you here that we may concert proper methods per first. No time now to be lost.

July 8, 1716. I am, etc.

Both Sloane and Mead were men of considerable distinction in the London life of the period and wielded power at court. Blair had never borne arms, never received pay or a commission, all of which was in his favor. After great pleading and interceding, Patrick Blair was pardoned. The gossipy Thomas Hearne wrote to one of his friends:

. . . I thank you for the Account of Dr. Mead's & others' Benevolence to poor Dr. Blaire. Dr. Mead is certainly a most excellent Man.

The claims of the Pretender probably found little response in the heart of Blair after his release from Newgate. He decided to remain in London. His stay in London was for only a few years, when he removed to Boston in Lincolnshire. There he wrote his only medical book: "Miscellaneous Observations in the Practise of Physick, Anatomy and Surgery." . . . London, Printed for William Mears at the Lamb without Temple-bar, 1718.

This was a collection of letters that he had previously written to Mead, Petiver and Sloane, to which were added some letters to Dr. Baynard on his experiences with cold baths, not only as a therapeutic measure but as a matter of daily hygiene. To Dr. James Douglas he wrote of the healing of fractured bones; to Dr. Mead on paracentesis for ascites and there were some observations on swollen glands.

His last medical report was made before the Royal Society in 1720. He was now a Fellow, having been admitted some years previously. This was an account of a boy who was sick for three years with periodic attacks of fever, during which time he was never observed to take nourishment. In the course of the description, mention is made of a fever followed by loss of the use of the limbs, with subsequent recovery in all except one. One experiences the thrill of having found the first case of poliomyelitis, until further description reveals the fact that during the time of the illness, the boy never passed stool or urine. The reader must then be content to allow it to go down in history as an "extraordinary case." As this report throws some doubt on his veracity and powers of observation, in justice to Blair it should be mentioned that the details of the illness were sworn to by the parents, "at the court of the barony of Errol." Further critical analysis reveals that during some of the time that this boy was sick, Patrick Blair was languishing in Newgate. In fact, the chief criticism to be leveled at the man is in connection with his willingness to accept facts on hearsay rather than personal observation.

From this time on, his interests were chiefly concerned with botany, and his publications on this subject have kept his name from oblivion. His "Botanick Essays" published in 1720, contain his observations on the sexes of plants, on which his fame has rested. Theories of plant generation had been advanced by others long before him, but Blair had the ability to convince his fellows of the importance of the doctrine. In the same year he reported his studies on the virtues of plants. The study of the actions of the various plants on the human body was a major part of the therapeutic knowledge of an eighteenth century physician. It was commonly believed that if one plant had a certain effect, other plants of a similar appearance and structure would have a similar effect. Blair became convinced that a better means of study would be to find the

proper menstruum for extracting the active parts and from that to observe their virtues.

Blair's last publication appeared in parts:

"Pharmaco-Botanologia: or, An Alphabetical and Classical Dissertation on all the British Indigenous and Garden Plants," London, 1723-1728. The manuscript was over ten years in preparation, and the work came to an abrupt end, concluding with the letter H. It is presumed that his death about this time interfered with its completion.

SUMMARY AND COMMENT

Patrick Blair M. D., F. R. S., gained notable distinction as an anatomist and botanist among the physicians and scientists of the early eighteenth century.

In 1717, he reported an unusual case before the Royal Society, which is probably the earliest description of pyloric stenosis in an infant. One cannot expect to find a twentieth century description of the disease; his unfamiliarity with the picture may account for some of the unusual features. There were a thick peritoneum, a small stomach and an involvement of the duodenum. But the balance of the description is so strikingly typical that it admits of little doubt of the identity of the disease. Among the outstanding features that would be difficult to reconcile with any other diagnosis may be mentioned: the sudden onset at the age of 1 month, the persistent vomiting throughout the illness, the eagerness for food, the extreme emaciation, the obstruction to food entering the intestines and the cartilaginous pylorus. The condition in the lungs admits of various interpretations, one being a terminal bronchopneumonia with abscess formation.

The life of Patrick Blair needs to be rewritten. There is a mass of unpublished correspondence among the Sloane manuscripts in the British Museum awaiting a biographer. This observant naturalist, botanist, pharmacologist and physician deserves to be remembered.

BEHAVIOR PROBLEMS OF CHILDREN WITH SPECIAL REFERENCE TO DELINQUENCY *

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Problems of juvenile behavior are engrossing attention throughout the world. Children, being less numerous proportionately than adults in the population, have more attention given to their problems and difficulties. The larger percentage of older persons in the community evidence considerable concern over the alterations in juvenile behavior. All too frequently persons with more maturity of age than of reason dogmatically state that the cause is A or B, or X or Y, and that its prompt removal will cure all the difficulties in the juvenile approach to life.

Some attribute all juvenile misbehavior entirely to mental deficiency, others to disturbances of the thyroid gland, to parental inadequacy, to the diminished authority of religion, or to some other single factor. Just as all behavior is the total response of individuals to life and living, so all unacceptable behavior must be regarded as a response to all the internal and external stimuli that impinge on the total integrated human being whose behavior is under criticism. One cannot consider behavior problems as primarily physical, emotional or intellectual. Certainly, mental impairment in the sense of feebleminded-ness, of psychosis or even epilepsy is not to be held responsible for the major maladaptations of children finding their outlet in delinquent behavior.

According to statistical studies of Healy and Bronner, the psychopathic group among juvenile delinquents is not above 11 per cent, and this is in harmony with Burt's observation of 15 per cent in London. The mentally defective group among delinquents is larger proportionately than in the general population, but this does not indicate causal relations. Psychoses among children are uncommon and equally so among delinquents. Even though figures for older criminals show more abnormal mental states, there is need to demonstrate a definitely etiologic relation between many criminal acts and the psychoses. A person with paranoia may commit homicide, but so may another with alcoholism in his uninhibited excitement, or a burglar intent on making his escape. One must distinguish between concomitance and causality.

* Submitted for publication, June 9, 1930.
* Read before the Medical Society of the County of Queens, May 27, 1930.

If one assumes the complete freedom of voluntary action, one believes in personal responsibility, which is behind one theory of punishment. There still remains the question as to why the free will determines on its peculiar activity. If all delinquency is deemed a disorder of mental make-up, free will or no free will, the cause of the mental aberration calls for investigation.

If all behavior is determined, whether in terms of Watsonian conditioning or in terms of psychic conflicts beyond conscious control, there follows the need for unraveling the mystery of delinquent behavior.

BEHAVIOR IS SOCIAL

All behavior must be considered with relation to other people. What is right or wrong, or good or bad is determined by some standard or code. Social standards, customs, laws and conventions determine the bases of delinquency and crime. There can be no truancy until there is a law requiring school attendance. The law as a reality gives one cause for opposition to daily attendance. There can be no lying as delinquency when states teach children to lie, as was done in Sparta and Persia. There can be no rape where sexual freedom is permitted adolescents, as among many primitive people. Delinquent behavior, therefore, grows definitely out of social forms and norms.

Human biology may perhaps be regarded as lacking, and this is delinquency when it does not conform to a useful conserving biologic norm. A congenital cardiac disorder is defective organization. Its effect on the total energy of the child may cause his behavior to vary from accepted standards of normal activity and may lead to self-centeredness with appropriation of property as a compensation for his physical inferiority. The appropriation becomes theft only when a social judgment so declares it, but the remote physical basis is not always recognized as an adequate causation. The body wants and society denies its wishes. A conflict thus arises between biologic urges and sociologic pressure. From the conflicts between these two basic elements in organization arise the numerous distinctive types of behavior termed normality, eccentricity neurosis, psychosis, delinquency and crime.

The conflicts of life have variable energy values. The emotional cores of complexes due to sexual states and problems and the inferiority complexes with their energizing components tend to be discharged into action. Just why a specific behavior results is still a moot question. I need not thresh out the mechanisms involved in human activity, because it would lead to a long and fruitless discussion of the psychologic principles of Freud, Adler, Jung, Rank, Ferenczi, Stekel and Eichorn and others. It suffices to say that the psychogenetic origin of

delinquent behavior is not different from any other behavior. Placing the cause in the unconscious does not alter the fact that the measure of the social value of any human activity lies in the time, place and circumstances as interpreted by society or by one of its effective units, such as the home, the school, the church, the lodge, the union or the political party.

One may consider behavior of one type as thoroughly adequate with relation to oneself and wholly regardless of society. This is asocial behavior. Such self-adequate behavior for example, may find its expression in early escape reaction form, such as neurosis. Early disobedience and tantrums which of course represent potential delinquent behavior, idleness, giggling, auto-erotic practices, anorexia, sleeplessness, failure in school, some phases of stubbornness, shyness, fears and even running away from home in early life constitute behavior that may bring about a complete sense of self-adequacy without regard to society.

Such reactions in early life may become patterns that are later transformed into antisocial activities. Their early origins are largely egotistic and are relatively free from components arising from herd impulses.

Another form of behavior may be thoroughly adequate for social acceptance even though largely selfish in character. Moderate inebriety is not rejected as asocial or antisocial. Nor does society wholly disapprove of types of early lying which later may serve as the background of definitely antisocial perjury. Modesty born of shyness, and diffidence born of fear are other suggestions of behavior types that are socially acceptable even though they have definite limitations in value for the individual and society at large. These are a few of a large group of the more common forms of socially accepted behavior the positive and negative influences of which depend on the natural anatomic and physiologic organization of the individual and the character and regulations of the home, the school and the other groups to which the individual belongs. The desire to find an outlet for his inner urges, while at the same time benefiting by his sense of social security, determines many forms of a person's reactions.

Extravagance in speech and expenditures for the sake of promoting one's position in the group is not far removed from the background of the confidence man or embezzler. Boastfulness to secure place in a group is related to mythomania. It takes little imagination to grasp the relation between treating one's companions to hold their good opinion and stealing to continue the treating. The desire for recognition and response conduces to socially acceptable behavior which later may be established on unacceptable levels. Lying to save one's face in a group is not identical with lying for the sole purpose of deception for personal gain. Lying to a sister or a brother is evaluated differently from lying

to a parent or a teacher. A lie in behalf of parental reputation differs from a lie to defame the character of an enemy. All of the energy value of the behavior is not inherent in the personal reaction.

Behavior may be socially unacceptable and regarded as definitely antisocial. In this category one finds stealing, embezzling, sexual aggression, assault, battery, brutality, truancy, perjury, larceny, forgery, manslaughter, murder and a large variety of behavior responses which are given legal names and status, though some of them may be as vague as vagrancy and as uncertain as cruelty.

In this behavior group the social element is dominant. The reactions are definitely contrary to social welfare. Stealing to save one's family from starvation is none the less antisocial. To condone or accept perjury would defeat law and justice. Truancy is active disregard of a social mandate. Antisocial conduct is such because it attacks life, liberty, property right and the social concord that guarantees the pursuit of personal happiness.

The regulation of behavior is partly conditioned by social status. Some behavior levels are conditioned by physical inheritance. Far more responsibilty, however, rests on social inheritance. It is more or less recognized that the same standards of juvenile behavior do not obtain, nor are they exacted among superior and inferior economic groups. The professional class and the unskilled labor groups are not held to the same degree of accountabilty. The social idea of noblesse oblige still exists. There are definitely observed distinctions between the behavior of rural and urban children, between the children in a densely populated area of the city and those who form a relatively small group to the square mile. Behavior characterisitics develop also from theoretic differences between nationalities. In different environments one finds marked alterations of some of the behavior responses of Negro, Mongolian and white children. There is, however, a modification of their behavior according to other elements of social grouping. Thus an only Negro child in a white class or any only Chinese child in a group of Caucasians do not offer reactions normal for their types in more natural groupings. Variations in behavior, even in relation to delinquency, are bound up in problems having to do with parental nativity and familial religion. The Catholic or Jewish child in a Protestant school is subjected to influences and social pressures that would not obtain in schools belonging specifically to his own or to a more mixed group. Similarly, an Irish child in a dominantly Italian school or a Russian boy in a dominantly German school manifests definite changes in aggressive or submissive behavior as compared with such children in the group that constitutes their natural social milieu.

All discipline arises from self-denial, which is the foundation of

self-control. The changing rhythm and range of the personal ego forms the basis of all social behavior. From the standpoint of preventing delinquency, nothing is of greater service than the development of a willing obedience to existent and potential laws. The conflict between the egotistic "do" or "wish" and the social "don't" or "must" finds its solution in varying organic responses. That which is most acceptable to the individual may be regarded as delinquency by society, whereas that which a community regards as wise and conformative to social regulation may constitute the basis of personal unhappiness and even neurosis for the individual.

DISTINGUISHING DELINQUENCY

Delinquency is not a biologic trait, though it may arise from biologic tension. The natural biologic urges are for self-protection, self-development and self-advancement. The social urges are not organic, but result from training. The innate drives meet social opposition and restraint, and emotional reactions containing a variable content of heat and energy result. The line of action as the resultant of two forces is not predictable, nor is its final direction irrevocably fixed at any period of life. During youth the energies are most volcanic, and self-denials less easily accepted. Hence the period of youth is richest in revolt, with disregard or rejection of social demands and regulations. To be the law and to constitute the law is the egotistic wish, but its realization is difficult. The change of thought from "I" to "we" represents a surrender to the mandates of the majority, whether localized in the home or coextensive with the universe.

Various forms of behavior which are asocial in the beginning may become transformed into social behavior. The asocial tantrum, for example, may become transformed into righteous indignation or moralistic reforming. Similarly a comparatively harmless form of social behavior, such as staying out late or running away from home, may become definite antisocial behavior, such as truancy or predatory vagrancy. Essentially social behavior under certain conditions may become definitely antisocial. Thus truth-telling becomes antisocial when it gives information contrary to mass welfare during a state of war. The antisocial act of stealing may achieve social approbation when the theft is in behalf of natural defense, and lying or its exalted form of perjury is approved when it is employed to safeguard a woman's honor.

The obedience, conformity and acquiescence which make for the maintenance of the status quo of society become the essence of socially good behavior. The discipline of self brings about a subjection of aggressiveness, independence of thought and frankness of expression which limits the ego within the uncertain confines of a generally static

social life. The dynamic alterations in the mode and content of social living depend on certain resistances to self-denial despite social pressure and oppression. The personal force rises above regulations and dares to assert itself. Whether such egotistic action is right or wrong depends on a social judgment. An ethical action may be thoroughly antisocial. One need only recall the attitude of society toward conscientious objectors. Had George Washington been unsuccessful, he would have been known in history, as he was known in England in his time, as an English rebel, and his patriotism would never have been held up as a model. Self-discipline, therefore, while it is a means of regulating behavior, does not in itself and by itself determine whether the resultant behavior will be construed as delinquent or nondelinquent. The saying "the difference between a gentleman and a drunkard is the price of a hack" may be recalled.

The self-denial of all men would result in social stagnation. One might ask whether society offers similar judgments on behavior when discussing violations of prohibition and other laws; whether the acts of Soviet Russia are measured by the same standards as obtained under the czars; whether the I. W. W. activities are viewed in the light of the movements of the American Federation of Labor; whether the actions of the poor, illiterate Mediterranean immigrant are regarded with the same tolerant generosity as those of the second generations of Nordic stock. How much of delinquent behavior arises from an interpretation in terms of prejudices and intolerances? And still progress demands mutations such as result from minorities that will not be quieted without resistance. Youth is the age for this resistance. But much depends on the background of each youth. The life history of the juvenile delinquent enters into his delinquency. His discontents, dissatisfactions and disappointments have registered psychically, and psychologic forces have gathered in his consciousness and also in the depths of his unconsciousness. He may not know the reason for his own delinquency any more than his parents do. The interpretations may be merely rationalizations. This is more likely to be true among psychopathic delinquents. Judgments concerning juvenile behavior as delinquent or nondelinquent depend to no small extent on the families of the children, their social position and influence, and the moral code and social level of the community in which they live.

BEHAVIOR IS INTEGRATED ACTION

The word discipline comes from a verb meaning to know, but knowledge is not the only element that enters into discipline. Behavior, as the expression of the total life of a person is often mistakenly attributed to

mental activity alone. This is entirely unwarranted. The child as a biologic social unit should be considered as a totality. He is more than his intelligence, his emotions or his physical organization. One must consider behavior, whether delinquent or nondelinquent, in terms of the whole child in his entire setting. He is what he is by reason of where and when he is. It must be borne in mind also that he is endeavoring to mold his environment as it seeks to affect and modify him.

In interpreting child behavior, it is essential to consider the influences of physical organization, including such hereditary factors as may be known, to appreciate the variations in physiologic activity and to have some insight concerning the intellectual potentials of the child, together with such knowledge as may be acquired concerning his emotional trends. Such information, however, can be interpreted only in the light of behavior reactions as the expression of social life. Hence, specific or generic behavior must be related to the patterns and precepts of the home, the school and the church together with such practices and reactions as are expressed in recreation, friendships, loyalties and group contacts. The variety of personal goals and reaction to individual interests, experiences and achievements bear on behavior. Any specific act is an end and a means to a larger purpose of life.

This perhaps appears to be too elaborate a scheme, but fewer errors are likely to occur from considering activity as a whole, even though with diverse parts, rather than from assuming that any one part constitutes the whole. A child with mental deficiency may steal, but this does not mean that the theft is due to the mental deficiency. A child with exophthalmic goiter may lie, but one dare not assume that the falsification arises from an oversufficiency of thyroxin. A child may play truant, but one cannot place full responsibility on his myopia. Shyness may be exhibited by a child with a brutal father; bullying may develop in a child from a home which the father has deserted; sexual perversions may be manifest in a child who has never attended Sunday-school; forgery may be committed by an only child; burglary may be more common among boys who live in a poor locality; drunkenness may be more prevalent among girls whose fathers are bootleggers; promiscuity may be the practice of a minister's child or a prostitute's daughter. Who would have the temerity to suggest the probability of causal relations under any of these circumstances? There is in behavior multiple causality. Similar stimuli to different beings may give rise to totally dissimilar responses in behavior; it is equally true that totally dissimilar stimuli to dissimilar persons may produce identical responses. Both of these facts are accounted for by the wholeness of organic response.

THE DELINQUENT VERSUS DELINQUENCY

It is important to distinguish between a delinquent and delinquency. Law defines a delinquent in terms of delinquency. It is essential to differentiate, however, between behavior as delinquency and the behavior as representing a delinquent. This requires emphasis, though it is so obvious today that it requires little explanation. A single antisocial act may be a delinquency; the motivation behind it and the circumstances conditioning it and the make-up of the person responsible for it determine whether or not he is to be regarded as a delinquent.

Problems of delinquency may be the concern of the law, but the problems of delinquents concern physicians, social workers, psychologists, ministers and educators. Knowledge concerning the delinquent rather than his activity is essential for any rational treatment. There are far more statistical tables concerning the occurrence of delinquency than there are concerning the dynamic constituents of the delinquent. Our need at the present time is for more knowledge and less guess work about the violator of laws and traditions. The progress of civilization promotes delinquency. The popularity of the automobile, for example, has given rise to numerous laws involving people in all forms of misdemeanors, such as not carrying a license, making wrong turns and violating parking ordinances. The tabulation of the number of each of these delinquencies in various cities would cast little light on the inner organization of the violators of these regulations. Why do people violate laws? Why are there delinquents and criminals? The distinction between delinquency and crime is largely of age and degree. The physiologic, psychologic and sociologic forces that result in the delinquent and the criminal do not differ greatly.

It must be patent that in all conduct there focuses a complex series of forces, some of which are inherent in the biologic self-protective organization of the individual and others of which are bound up in his essential existence as a social organism. At birth he is at once a biologic and a social unit, and these two phases are as much bound up psychologically as physiologically. The social factors that condition biologic existence are as important for the development of the individual as his biologic organization is a necessary factor in his social success. His social life, his love life, his attainment of security, independence and achievement are bound up in the interaction of the individual and his world. This involves the world as interpreted by the individual, the individual as interpreted by the world and their respective attitudes and reactions toward their acceptance, toleration or rejection of the norms of activity that each demands of the other.

Misconduct is only a form of behavior that society rejects. Misconduct at one age is not so regarded at another age. Exhibitionism in infancy does not have the same social meaning as the same action in adolescence and senility. Adolescent homosexuality is not identical with that occurring in maturity any more than the theft of money at the age of 5 is identical with the theft of money at the age of 15. Fighting at 9 years and that at 19 years differ materially, as do threats to do bodily harm at 4 years and at 24 years. Is any physical or emotional action at the age of 2, 10, 21, 45 or 70 interpreted identically? One considers the behavior in the light of training for useful living, knowledge concerning social standards and realization of the meaning and force of social compulsion.

The community that condones violations of the law by adults, that disregards personal liberties and restricts individual freedoms creates emotional reactions against itself and sets in motion mechanisms conducive to delinquent behavior. There is always reaction to communal repression which results in new forces developing. Much of the reaction in present juvenile behavior is the result of efforts at social pressure.

THE REVOLT OF YOUTH

Every age stages its own juvenile revolt. Calcified arteries cannot carry the bounding pulsations of youth. Hence juvenile behavior is ever a source of difficulty to parents. Friction in parent-child relations is partly due to the social standards for parental training of children. A Puritanic age is usually followed by one of violent reaction. Wholesale freedom that becomes modified into license becomes self-regulative with the shift in social mandated activities. Some of yesterday's delinquencies are not those of today, such as the wearing of one-piece bathing suits at a public beach or changes in public attitudes that permit new sets of behavior. Delinquency and crime today are more startling because more dramatic. Disillusionment in war, work and women, greater accustomedness to firearms and women's greater consciousness of freedom have altered the behavior patterns of this age. There have been outbursts of unwelcome types of behavior that have set for juveniles patterns readily conducive to delinquency. The moving picture industry recently altered its code for screen productions, and this could only have been the result of a belief that the presentation on the screen of various forms of misbehavior tends to lower the moral tone of the population with resultant disadvantage. The masculine suppression of women and the forceful restrictions of sexual taboos over a long period of time have resulted finally in emancipation, politically, industrially and emotionally, so that girls present new forms of behavior in which the question of delinquency is less obvious than it was in an age that

demanded female chastity at all costs. The greater freedom of this age is evident in the use of tobacco and alcohol and in sexual relationships.

The influence of parental patterns in bringing about delinquent behavior of the young cannot be calculated. Parental neglect and cruelty, quarreling, lawlessness, immorality, criminality and selfish exploitation of children for the satisfaction of emotional needs or economic gains influence juvenile behavior far more than do poverty and ignorance alone.

The community, with its own standards for behavior, helps to establish positively and negatively the code for the young. It is responsible for much of juvenile delinquency which may be little more than the result of a premature assumption of adult characteristics. When social standards are relaxed so as to be more in harmony with the individualistic impulses of people, the proportion of delinquency declines. If, for example, sexual freedom in cohabitation is regarded favorably by society, fewer girls will be arrested for sexual offenses.

Social elements that enter into delinquent behavior include such diverse factors as insufficient recreation, unsatisfactory companionship, school failures and educational dissatisfactions, early entrance into industry and inadequate habits of work. It is unnecessary at this time to analyze the relations of these items, but it is patent that they have definite relationships to the welfare of the ego. Consciousness of social maladjustment, even the sensing of relative incapacity in the presence of some special group or a feeling of embarrassment in social experience because of demonstrated inferiorities profoundly affects behavior. The relationship between cripples and vagrancy is not entirely a matter of the physical limitations. Changing of jobs is not entirely a question of inadequate training. Truancy is not a problem wholly conditioned by defective mentality. Vagabondage and homosexual gang life may be the result of inadequate social provision for normal outlets for the emotions. I might dwell on the necessity for social supervision and guidance of youth during school life with adequate adjustments in classes, subjects and vocational opportunities. I might urge the necessity for a more intelligent approach to the vocational problems of the young and more intelligent placement. I might stress the need for a more rational development of recreational opportunities for adolescents, particularly during the stormy years when excitement, adventure, questioning, doubts, revolts and emancipation are dominating their psychology and giving rise to deep and intense emotional conflicts.

SOME PHYSICAL BASES

No one can deny that there are some physical factors that condition delinquent types of activity. There is little doubt that physical precocity among girls is a factor in fostering what are termed sex offenses. There

is every reason to believe that the natural emotional instability of adolescence leads to impulsive adventures, closely allied with delinquency. This is exemplified in the collegiate groups who, if they were not collegians, probably would be more promptly arrested for delinquent behavior.

Undeniably, various types of endocrine disturbance lead to a wide range of antisocial behavior. Disorders of ductless glands may cause delinquent behavior, as when a person with diabetes steals food because of the bodily craving. A hyperthyroid or hypothyroid condition may predispose to many antisocial and asocial actions. On the other hand, many glandular dysfunctions are merely coexistent states with unrelated disorders of conduct. Furthermore, the glandular dyscrasia and the delinquency both may be due to some common underlying cause, such as syphilis. Almost any physical defect, from divergent strabismus to spinal bifida, may be a causal element of antisocial behavior.

Some diseases, such as encephalitis or dementia paralytica, may in themselves promote antisocial activities, such as pyromania, forgery, sexual violence, theft and even homicide. One concedes that congenital or acquired mental deficiency or epilepsy may be the important factor in juvenile delinquency. It is desirable to recall that mental deficiency is relative to some social norm, while epileptic behavior varies considerably according to social setting, whether rural or urban, in an atmosphere of noise and speed or in one organized with system and quiet.

The neuroses in their protean forms may be the result of special physical disabilities, and they may be responsible for diverse deviations in behavior. The psychoses play a real part, but not as great as is sometimes urged. Healy and Bronner, in a study of 4,000 repeated juvenile offenders, reported 72.5 per cent of them normal mentally, and in a smaller group reported only 10 per cent feebleminded and 5 per cent psychotic.

Even when physical and intellectual factors appear to be of pronounced importance one often finds that their significance is secondary to that of the entire social setting which accentuated their handicapping value. It is the lack of satisfaction of the ego, the failure to realize a harmony in the love life, the sense of social insecurity or the drive for an inner contentment that causes emotional surges into activities that are rejected by persons less disturbed in spirit and soul. This is the dynamic component that is energized by living rather than by life itself. What I am and what I am to be is more significant than the mere fact that I am. The former is my vital relational self and the latter is my absolute self, a machine for adaptation.

BEHAVIOR PROBLEMS ARE SPECIFIC

I have said sufficient to indicate that the behavior of children arises from no single cause. I do not say normal behavior because the term is difficult to define. It is rare, indeed, to find a single type of behavior absolutely determined by a single specific factor. One cannot even be certain that sticking a pin in a person will cause a drawing away of the part stuck. Behavior is conditioned by more than a single stimulus; hence it is unpredictable. In the total integrations of people, a situational psychology obtains, and this involves within it all conflicts between personal and social goals. The situation changes, and changes the child; the child changes, and changes the situation. Moral delinquencies are not explainable in panacetic terms of inferiority complex, of thyroid deficiency, or even of specific psychogenetic drives resulting from parental fixations and identifications. A multiple causation remains as the foundation idea of all juvenile behavior, nondelinquent or delinquent.

The behavior problems of children, therefore, must be regarded as specific rather than generic. They call for the individualized diagnosis and treatment of children. They demand the orientation of the individual in his community and a recognition of his growth and functional development with reference to any specific form of delinquency under investigation. The problem of juvenile behavior cannot be solved by giving attention to the individual child, isolated and alone. There are causes to be sought in the organized life of the individual in his home, the school and the community. Blanket regulations and omnibus methods as a rule do not lead to successful personal readjustments. The problems of broken homes, parental instabilities and demoralizing influences in the home cannot be disregarded; nor may communities disregard the limitations of their educational systems in providing for early juvenile success and satisfying achievement. The approach to the motivation of the delinquent involves his experiences in living under social regulation. He may love unwisely, hate too well, seek revenge, desire to return in kind for fancied wrongs or find some compensating escape for an active conflict.

Communities as well as individuals may be guilty of delinquencies. Hence one must study society as a delinquent and the individual as a delinquent and mete out such treatment as each may require to bring about a harmonious interaction favoring nondelinquent behavior. It is apparent that all juvenile behavior, including that of the youth called the delinquent, must be accepted and studied. The delinquent must be studied and treated as an individual rather than be obliged to suffer a penalty for the delinquency according to some formula that represents paying for the social disapprobation of his specific delinquent act.

The behavior problems of children are not to be considered as essentially mental nor as prima facie evidence of mental disability or disease. In some ways, the delinquent is one of the challenging factors of civilization; he is an indicator of communal maladjustment. His problems are the problems of the community. He is striving for a personal satisfaction and harmony which in some way are at variance with the standards of the community. There are times, however, when the delinquency is wrong but the delinquent is right, just as there are times when the punitive action of a community may be right but the community itself may be ethically wrong.

SPECIAL ARTICLE

THE SECOND INTERNATIONAL CONGRESS OF PEDIATRICS

The first International Congress of Pediatrics was held in Paris in 1912. At that meeting it was voted to hold the second meeting at Brussels in the summer of 1914. For obvious reasons, this design was not carried out.

Through the patient and continued efforts of Prof. I. Jundell of Stockholm and due almost entirely to his diplomacy, it was possible to have the congress continued, this time to be held in Stockholm. So, after a lapse of eighteen years, the pediatricians of the world gathered in the Swedish capital, to experience an association and contact which most of them had never had before.

BUSINESS MEETING

The meeting of the delegates took place at noon, August 18, in the rooms of the Swedish Medical Society. Before going to this meeting, most of the members who had registered for the Congress had visited the business office in the Concert Hall where the scientific meetings were to be held. Here each member had a pigeon-hole for his programs, etc. These were arranged alphabetically under each country, the information for the wives being placed in the husband's compartment. Practically all the attendants spoke English, French and German, and every detail was arranged for our instruction and comfort.

At the business meeting, the delegates were all seated at long tables, those from each country sitting together. The following countries were represented: America (U. S. A.), Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Czechoslovakia, Denmark, Esthonia, France, Germany, Great Britain, Greece, Holland, Hungary, Iceland, Italy, Japan, Jugoslavia, Latvia, Lithuania, Norway, Palestine, Peru, Poland, Portugal, Roumania, Spain, Finland, Sweden, Switzerland, Uruguay and the United Socialist Soviet Republics. Professor Jundell, chairman of the Swedish committee, presided. The business was transacted in three languages. The chairman spoke in German; then an interpretation was made, first into French and then into English. This was due largely to the fact that Professor Jundell spoke German fluently, but apparently had some difficulty with French and little speaking knowledge of English.

The chairman opened the meeting with a statement of the aims of the Congress and words of greeting to the delegates. Among other papers that we had obtained at the business office was a pamphlet (printed in English, French and German) of some proposed changes in the Constitution and By-Laws of the Congress. After some debate, principally on the part of the French, Belgian and Italian delegates, but also participated in by the Germans and Scandinavians, it was decided to make no changes. After these points had been decided, the question of the place of the next meeting came up. Invitations were received from Brussels, Amsterdam and London, the last being a formal invitation from the British Society for the Study of Disease in Children. For the first time there seemed likely to be a sharp division. (It is interesting to note here that while each delegation had at least one vote, a country's voting power also depended on the number of members registered. The total registration was about 600, and of these the Swedes constituted over 100 and the Americans about 80.) After some discussion without much headway, the chairman asked for a recess for lunch. Any one who has partaken of Swedish hospitality knows that the term "lunch" is a misnomer for any meal served there.

Professor Jundell was elected president of the Congress; Dr. Malmberg, secretary and treasurer; and Professor Nobecourt of Paris, Professor Jemma of Naples, Professor Parsons of Birmingham, England, Professor Moro of Heidelberg and Professor Grulee of Chicago, vice-presidents.

At the afternoon session, the invitations from Brussels and Amsterdam were withdrawn, so that the invitation from London could be accepted. After some debate, it was decided to hold the next meeting in 1933. Professor Still of London was elected president, the secretary and treasurer to be determined by the British pediatricians. The amount of dues is to be determined later.

SCIENTIFIC SESSIONS

Scientific sessions were held in the Concert Hall. There is a large central hall with many smaller halls around it. The general sessions were held in the morning in the large hall, and in the afternoon, papers were read in the small section rooms.

The opening meeting was held at 10 a. m. on Tuesday, August 19. Professor Jundell, president of the Congress, was in the chair, and the opening address was made by H.R.H. Crown Prince Gustav of Sweden. This was a masterly address delivered in English. It covered the whole scope of pediatric activity and showed a grasp of the subject which was most pleasing to all present. Dr. Jundell then made a short address.

The formal election of the president, vice-presidents, secretary, treasurer, chairmen and vice-chairmen of the section meetings was next to have attention.

Following the address of the Crown Prince, Dr. Nobecourt of France, vice-president, took the chair, and an address was delivered by Prof. A. H. Hess of New York on "The Biological Effect of Direct and Indirect Ultraviolet Irradiation." This was discussed by the following persons: P. F. Armand-Delille, Paris; G. Frontali, Pavia; H. J. Gerstenberger, Cleveland; E. Gorter, Leyden; J. Hess, Chicago; I. Jundell, Stockholm; E. Lesné, Paris, and P. Medowikoff, Leningrad.

In the afternoon, the following small sections were held:

Room I	Room II	Room III
Professor Knoepfelmacher (Austria)	Professor Pechère (Belgium)	Professor Wright (Canada)
Professor Klercker	Dr. Fürstenberg	Dr. Gyllensvärd

Room IV	Room V	Room VI	Room VII
Professor Brdlik (Czechoslovakia)	Professor Hainiss (Hungary)	Professor Acuna (Argentine)	Professor Luus (Esthonia)
Dr. Sundberg	Dr. Nordgren	Dr. Böttiger	Dr. Belfrage

It is to be noted that all the vice-chairmen are Scandinavian.

The second day's session, on Wednesday, began at the usual hour, 10 a. m., with Professor Jemma of Naples in the chair. The subject for discussion was "The Physiological and Pathological Significance of the Thymolymphatic System." The main essayists were: J. A. Hammar, Uppsala; C. Cattaneo, Milan; E. Moro, Heidelberg; G. Mouriquand, Lyon. When all had finished, Professor Parsons took the chair, and the papers were discussed by the following: H. Finkelstein, Berlin; P. Lereboullet, Paris; E. Lövegren, Helsingfors; A. Nitschke, Freiburg; A. Ylppö, Helsingfors. Wednesday afternoon the following meetings were held:

Room I	Room II	Room III	Room IV
Professor Michalowicz (Poland)	Professor Bloch (Denmark)	Professor Spyropoulos (Greece)	Professor Fischl (Czechoslovakia)
Dr. Höjer	Professor Klercker	Dr. Johannssen	

Room V	Room VI	Room VII
Professor Manicatide (Roumania)	Professor Moreira (Brazil)	Professor Wateff (Bulgaria)
Dr. Wallgren	Dr. von Sneidern	Dr. Akerren

On Thursday morning, Professor Moro of Heidelberg was in the chair. The subject for discussion was "The Psychology and Pathopsychology of Childhood: Their Significance as a Branch of Pediatric

Research and Teaching, and Their Application in Medico-Social Work." The essayists were R. D. Gillespie, London; F. Hamburger, Vienna; V. Pechère, Brussels. Professor Moro then gave the chair to Professor Grulee, and the following discussed these papers: Margaret Fries, New York; G. Heuyer, Paris; R. P. van de Kasteele, Scheveningen; G. Scheltema, Grönningen; W. Wernstedt, Stockholm.

On Thursday afternoon, the following small sections were held:

Room I	Room II	Room III
Dr. Perera y Prats (Spain)	Professor Weiland (Switzerland)	Professor Tumenième (Latvia)
Dr. Lichtenstein	Professor Thorling	Dr. Heinemann
Room IV	**Room V**	**Room VI**
Professor Gartje (Latvia)	Professor Yhpö (Finland)	Professor Scheltema (Holland)
Dr. Lindberg	Dr. Erdberg	Dr. R. Hybinette

At 5 o'clock, the Congress reassembled to adjourn until its next meeting, to be held in London, August, 1933.

One other session, which can scarcely be called a scientific session, and yet which was most impressive, was the ceremony in the Cathedral at Uppsala. The American delegation placed a wreath before the memorial inscription to Nils Rosen von Rosenstein. This was accepted by the chancellor of the University of Uppsala, the dean of medicine and also by Professor Jundell. A very interesting account of von Rosenstein's work and life was given by Dr. John Ruhräh of Baltimore.

SOCIAL ENTERTAINMENT

While at such meetings as these one obtains much information and inspiration from discussions, one probably gets as much of value from the contact with individuals. Certainly the social side of the Second International Congress of Pediatrics was in no way neglected.

On Monday evening, an informal dinner was given by the Medical Society of Stockholm at Hotel Gillet. This was a most delightful affair, at which everything was informal, and it was enjoyed by everybody. Many of us met old friends whom we had not seen for years, and learned to know personally others with whom we had corresponded many times. Names that were known the world over because of their connection with scientific investigations were to be heard on every hand.

On Tuesday evening, a most remarkable banquet was given by the city of Stockholm in the capacious banquet hall of the beautiful town hall, at which there were seated 720 men and women. It is interesting to note that the wives were included in all these social func-

tions, but still more remarkable was the fact that though your knowledge of languages was limited to one, you always found that your partner could speak that language. This was the most impressive social function of the meeting, and it was carried out with such efficiency that no one felt the immensity of the effort.

Wednesday evening a special performance was given at the Royal Swedish Opera, in which the well known Swedish baritone, Forssell, took the part of Don Juan. He had not appeared previously for ten years, and although 66 years old, his voice was as clear and perfect as any to be heard on the operatic stage.

There was a banquet Thursday evening at the Grand Hotel Royal. This was the official Congress banquet, and while not as large as the one given by the city of Stockholm, in other ways it was almost its equal.

To those who attended these banquets, several things were interesting. Before one rose to speak, there was a fanfare of trumpets, and his name and country were announced. The Swedish Committee planned with the greatest care to have each member and his wife seated next to some one who could speak the language which they understood. When one realizes that this meant English, French and German at least, and sometimes Italian, one can realize the colossal task which they undertook and carried out to such perfection.

C. G. G.

Pediatric Biographies

GEORGE ARMSTRONG

JOHN RUHRÄH, M.D.
BALTIMORE

George Armstrong, one of the most notable figures in the history of pediatrics, was the brother of the physician-poet, John Armstrong, and like him was endowed with a peculiar personality which militated against his chances of continued success. Little is known about him, not even the date or place of birth. Caulfield stated that his father was Robert Armstrong, a minister of Castleton, 1693-1733, which would bring the date of his birth sometime before 1735. He practiced pharmacy at Hempstead, and then, after qualifying as a physician, went to London and started the first hospital and dispensary for the children of the poor in a house in Red Lion Square. Infants up to 4 years of age were treated, as half of those born in London died by that time. This establishment was opened in 1769 and was in operation until 1781, when, according to Buchan, it was closed for lack of financial support. Armstrong gives a different reason (Caulfield):

> But as that charity has been at a stand for some time on account of my bad state of health which put it out of my power to attend it (he was stricken with a "paralytic complaint" about this time) I shall not trouble the Public with a particular detail of the Institution, contenting myself with explaining the nature and usefulness of it, which, perhaps, may some time or other induce some other person to take it up.

The date of Armstrong's death is usually given as 1781 (Boas, Index Catalogue), but Caulfield called attention to the fact that he was evidently alive after the closing of the dispensary in this year.

Armstrong made good use of the immense clinical and pathologic material at his disposal, and the little book which he had issued in 1767 with the title of "An Essay on the Diseases Most Fatal to Infants, to Which Are Added Rules to be Observed in the Nursing of Children, with a Particular View to Those Who Are Brought Up by Hand," was translated into German the same year by George Conrad Gsellius; another German translation dated Regensburg, 1786, is by D. Jac. Christian Gottl. Schäffer, and an Italian edition by some one unknown was published in 1793. It was reprinted with additions in 1771, and in 1777, a second volume was issued entitled: "An Account of the Diseases Most Incident to Children from Their Birth to the Age of Puberty."

With this was also the pamphlet "A General Account of the Dispensary for the Infant Poor" which had been issued separately in 1769 as propaganda for raising funds for the dispensary. This was reprinted in 1783, and in 1808, A. P. Buchan reedited it with additions and included the essay on nursing which had been printed in shorter form in 1772.

In that most interesting book, "Medical Bibliography A.B.," James Atkinson of York comments on Armstrong as follows:

There is considerable practical information, and much childishness about Armstrong. He recommends his profession with warmth, and laments its neglect and

A N

E S S A Y

ON THE

D I S E A S E S

Moſt Fatal to INFANTS.

To which are added

RULES to be obſerved in the NURSING of Children:

With a particular View to thoſe who are brought up by HAND.

LONDON:

Printed for T. CADELL, in the Strand.
MDCCLXVII.

Title page.

abuse with censure. The cradle and the nursery have been much obliged to him; for he who saves the king's subjects, earns him a great deal of money; and he who preserves the life of a child, rescues it at least from a very stupid sojourn in limbo.

Armstrong visualized the possibilities of infant welfare, especially that part dealing with the treatment of the sick child. He put some of his ideas into practice, but something, just what is a question, prevented his institution from enjoying a lasting success, and he died in obscurity and poverty, the fate of most of those who seek to help their fellow men without thought of their own old age.

He was not a bad physician, for while he was given to "antimonial pukes" and sometimes bled and blistered, his therapeutics were reason-

ably sound, especially so for the age in which he lived. He knew the danger of opium and the virtues of rhubarb, calomel and mercury and chalk. He also knew the value of proper diet and the care of the child.

His book includes among other things accounts of inward fits, watery gripes, convulsions and thrush. In the 1771 edition of his book he describes three cases of pyloric stenosis, so far the first noted in the earlier literature. This is in his account of watery gripes and is as follows:

In a child about three weeks old, that died of watery-gripes some time since, and which I opened, I found most of the stomach, towards the upper orifice, and almost the whole fundus, in the same tender state with that of the child just now mentioned. But towards the *pylorus, the* structure was firm enough, as likewise that of the intestines, both small and great. The stomach was quite distended with curdled milk and victuals, with which the nurse had crammed the child, mixed likewise with some of the chalk julep, but the whole intestines were remarkably empty. There was no morbid appearances to be observed any where but in the stomach; and this *viscus* being so full, while the intestines were almost empty, it looked as if the disease had been chiefly owing to a spasm in the *pylorus*, which prevented the contents of the stomach from passing into the *duodenum*. Perhaps, cases of this kind are more frequent than is commonly imagined; and it might probably be owing to the tender state of the stomach, that the antimonial solution, which was given the child, had but very little effect; and I have commonly observed, that when vomiting or purging medicines, given to infants in a sufficient quantity, have not the usual effect, it is a very bad sign. What is remarkable, this was the third child (and they have never had any more) which the parents have lost at the same age, and in the same disease.

His ideas on infant feeding are interesting, especially his description of the horn for feeding which he thinks superior to the feeding boat or spoon. Note also his use of massage or friction.

But though, as I just now observed, I do not advise dry-nursing of infants, when they can be properly suckled, yet I would not have parents to be discouraged from trying it when it becomes requisite, being firmly persuaded, that if a child is born pretty strong and healthy, it had better be brought up by hand, in the method to be afterwards explained, than suckled by an ailing nurse, or one that has not a sufficient quantity of milk. For, when I talk of a child's being properly suckled, I mean by a nurse who is healthy, sober, good-tempered, cleanly, careful, and has plenty of good milk. A wet-nurse ought likewise to have pretty strong nerves; for if they are weak, the least surprise has a bad effect upon the milk; or if the child happens to be suddenly taken ill, from the fright and anxiety, the milk is sometimes quickly dried up, when, perhaps, the poor infant has the most occasion for it. For this reason, some mothers, who are very fond of their children, make but bad wet-nurses, though well enough qualified for it in other respects.

There are two ways of feeding children who are bred up by hand; the one is by means of a horn, and the other is with a boat or spoon. They both have their advocates; but the latter, in my humble opinion, is preferable.

The horn made use of for suckling, is a small polished cow's horn, which will hold about a gill and a half. The small end of it is perforated, and has a notch

round it, to which are fastened two small bits of parchment, shaped like the tip of the finger of a glove, and sewed together in such a manner, as that the food poured into the horn can be sucked through between the stitches. This appears to be a very simple and ingenious contrivance, and is admired by some, who look upon it as a kind of artificial nipple; and it might very well be considered as such, if we had but the breast-milk to convey through it. Or if we could discover any food of the same thinness with the milk, and as nourishing as it is, the horn might still answer. But as a discovery of this kind is not to be expected, and the food which the child sucks through this artificial nipple must be thin, in order to pass between the stitches, there requires a larger quantity of it to nourish the child, and hence its stomach and bowels are too much relaxed, whereby it is in danger of falling into the watery gripes, as was the case with two of mine, which were fed for some time in that way.

While the child is suckled, I think the best food is crumb of bread boiled in soft water, to the consistence of what is commonly called pap, or a thin panado. The bread should not be new baked, and, in general, I think roll is preferable to loaf bread.

This pap should be sweetened with soft or Lisbon sugar, unless the child is of a lax habit of body, in which case the finest loaf sugar should be used; and in this case too, the pap should be made with biscuit instead of roll. It should not be made sweeter than new milk; for too much sugar both palls the appetite, and grows sour upon their stomachs.

Before the child is weaned, the victuals should be made thicker, by which means it will become less fond of the breast, and consequently, as was mentioned above, easier to wean.

If the infant is to be bred up by hand from the birth, it ought to have new cow's milk mixed with its victuals as often as possible, and now and then some of it alone to drink. Asses' milk will be still better, when it can be conveniently had, and the parents can afford it.

But the most useful exercise for very young infants, is rubbing with the hand; which cannot be too often repeated, nor continued too long at a time. They should be well rubbed all over, before the fire, twice a day at least, that is, morning and evening, when they are dressed and undressed; and the rubbing should be repeated from the loins downwards, every time they are turned dry, unless they have a purging, when it might fatigue them to have it done so often. There is nothing that infants in general seem more delighted with than this exercise, and it were to be wished, that the nurses would indulge them more in it. It will frequently make them quiet when nothing else will, and it is not only very pleasing to them, but conduces greatly to make them thrive, and to prevent their catching cold, by promoting a free circulation, and perspiration likewise; Providence having kindly connected the agreeable sensation and the benefit.

They are particularly fond of cramming them with fat, from a mistaken notion, that it must be light of digestion, because it weighs light in the scale; whereas, on the contrary, to most stomachs, there are few things so hard to be digested as fat.

Many poor children are likewise hurt by being crowded together in small close apartments, which is not so easily remedied; but in this case I always advise them to keep the windows open in the day-time, while the weather is hot, and the doors of the bed-chambers and closets during the night. I also object strongly to their living in stable-yards, the air of which is particularly unwholesome to children, as was before mentioned.

Armstrong's Dispensary was an interesting place, and it has been estimated that about 35,000 children were treated there. His reasons for establishing it are given in "A General Account of the Dispensary for the Relief of the Infant Poor," in which among other things he states:

It was likewise observed, that Children, till they arrive at three or four Years of Age, cannot be received into Hospitals (except in Cases of Accidents and the Stone) for several obvious Reasons; and though they might be admitted as Out-Patients, yet as none of the Hospital-Physicians see their Out-Patients oftner than once or twice a Week, and as the Complaints of Children, especially during the tender State of Infancy, frequently require more immediate Relief; if there was a Place established for giving Advice and Medicines several Times in the Week to the Children of the Poor, by a Person, who, from his Success in treating the Diseases of Infants for some Years past, hoped he might be deemed qualified for such an Undertaking, the great Mortality of Children might be diminished in some considerable Degree; as it could not be denied that Numbers were lost for want of timely Assistance.

For this Purpose a House was taken in *Red Lion Square*, where Attendance was given four Days in a Week, *viz. Mondays, Wednesdays, Fridays* and *Saturdays*, from Twelve till Two, to administer Advice and Medicines *gratis* to poor Children; and this Charity has been continued ever since, under the Denomination of, *The Dispensary for the Infant-Poor*.

But as it was not reasonable to expect, that the Institutor of this Charity should, besides his Time, Attendance, and Labour, bear all the Expenses of it; such as paying for the House, Medicines, and proper Assistance; it was proposed, that these Expenses should be defrayed in the following Manner: "That every Person subscribing One Guinea *per Annum*, should be intitled to have always one Patient at a Time on the Dispensary-Books; and every Person subscribing Two Guineas, to have two Patients; and so on, in the like Proportion."

News and Comment

UNIVERSITY NEWS

Vanderbilt University School of Medicine, Nashville, Tenn., announces the appointment of Dr. Samuel M. Bloomstein as associate professor of clinical pediatrics.

Dr. Rustin McIntosh of the Johns Hopkins Hospital has been appointed professor of diseases of children at Columbia University.

DEATHS

Dr. Juan Orrico, Director of the Pediatric Clinic at the University of Cordoya, Argentine, died on May 29, at the age of 53.

GENERAL

Children's Memorial Hospital Willed $200,000. By the will of Mr. Thomas D. Jones, the Children's Memorial Hospital, Chicago, has been left $200,000.

National Committee for Mental Hygiene

Fellowships in Extramural Psychiatry Announced by National Committee for Mental Hygiene.—The fellowships are open to physicians who are under 35 years of age and graduates of class A medical schools, and who have had at least one year of training in a hospital for mental disease maintaining satisfactory standards of clinical work and instruction. A longer period of hospital training is desirable. Applicants able to meet these requirements will not be required to take competitive written or oral examinations. Selections will be made on the basis of length and type of previous training in formal psychiatry, on general fitness for the work contemplated and, in most cases, on the results of a personal interview. These fellowships cover a period of training approximately one year in length. During this training period trainees usually are assigned for three to four months' periods to such places as the Boston Psychopathic Hospital, Judge Baker Foundation, Boston, Institute for Juvenile Research, Chicago, and other places of a similar nature, as well as to various child guidance clinics located in Cleveland, Philadelphia and other cities. The fellowships carry stipends of from $2,000 to $2,500 for the twelve months' period. Applications need not be filed within stated periods, but will be received at any time. In the case of successful applicants, arrangements will be made to begin work whenever mutually convenient to the applicant and to the director of the training center to which the applicant is first assigned. Applications or inquiries for further information should be sent to Dr. Frankwood E. Williams, Medical Director, National Committee for Mental Hygiene, 370 Seventh Avenue, New York.

Abstracts from Current Literature

Anatomy and Physiology

THE BLOOD PLATELETS IN INFANCY. E. FANTON, Clin. pediat. **12**:463 (June) 1930.

The author gives a comprehensive review of earlier researches and studies on the blood platelets. He describes plainly their morphology and histology, and enumerates the experimental alterations that he produced in these elements by the action of certain physical agents (alkaloids, salts of mercury, salts of lead) and certain hemolytic agents.

SIGNORELLI, New Orleans.

THE TOTAL NITROGEN INDEX OF THE BLOOD, URINE AND FECES IN THE INFANT CONSIDERED IN RELATION TO DIFFERENT TYPES OF FEEDING. ADELCHI SIMONINI, Clin. pediat. **12**:487 (June) 1930.

The author studied the behavior of nitrogen metabolism in infants on different diets. He records chemicophysiologic and biochemical data on the metabolism of proteins in general, which have led him to the conclusion that the nitrogen index in breast-fed infants tends to increase with the age of the infant, without, however, reaching beyond a definite physiologic limit.

In artificially fed infants he noted an excessive increase in the nitrogen index, which in his opinion explains the frequent development of dyspepsia, protein gastro-enteritis and intoxications. After the first year of age, and with the advent of a more varied diet in these infants, the nitrogen index appreciably and closely approaches that found in breast fed infants.

SIGNORELLI, New Orleans.

CHARACTERISTICS OF THE OXIDATION PROCESS IN CHILDREN. S. J. SCHAEFFERSTEIN, Arch. f. Kinderh. **89**:191 (Jan. 17) 1930.

Sixty-six children were studied, of whom twelve were normal, twenty-seven had nutritional disturbances, thirteen infectious diseases, twelve tuberculosis and two exudative diathesis. In the normal group the oxidation quotient (Müller) was between 0.8 and 1.2, and in the group with digestive disturbance not due to intoxication it was between 0.79 and 3.1; in four children with intoxication, the lowest quotient was 3.2 and the highest 8.4. In the infectious group the lowest quotient was 0.6 and the highest 4.1; both these patients had pneumonia. In the tuberculous group the quotient was uniformly low, between 0.8 and 2.5—and in the group of patients with exudative diathesis it was between 3.4 and 3.9.

SANFORD, Chicago.

A CASE OF PSEUDOHERMAPHRODITISM. K. RUPELIUS, Arch. f. Kinderh. **89**: 276 (Feb.) 1930.

A child, aged 3½ years, had more male than female characteristics. Several similar cases are discussed. A plastic operation is advised.

SANFORD, Chicago.

HYPERGLOBULICHEMIA AND HYPOGLOBULICHEMIA. J. MUSER, Acta pediat. **9**:411, 1930.

The method used for determinations of serum protein is based on the measurement of the area covered by a monomolecular layer of the protein on the surface of tenth-normal hydrochloric acid, and is applicable to 0.1 cc. quantities

Preliminary determinations in different age groups and under various conditions of health and disease confirmed the results previously reported by other authors. Dehydration may be accompanied, though not invariably, by an elevated concentration of both albumin and globulin fractions. In the presence of fever with infections the globulin is apt to be increased, often with a compensatory drop in the concentration of albumin. In athrepsia the globulin tends to fall, rising again with clinical improvement. The author believes that a low serum globulin is related to clinical susceptibility to infections, since it is in this fraction that antibodies are carried. This would explain the beneficial results of transfusion in such cases. A low concentration of albumin, with or without a correspondingly elevated globulin level, is often associated with the presence of edema; this is, however, by no means invariably true. The author intends to pursue his investigations further in this field.

McINTOSH, Baltimore.

Pathology, Bacteriology and Biochemistry

THE ASSIMILATION OF FAT IN INFANTS AFFECTED WITH ERYTHRODERMIA DESQUAMATIVA. C. DESSYLLA, Riv. di clin. pediat. **28**:292 (April) 1930.

Erythrodermia desquamativa is a type of seborrheic eczema. Using the method of Spolverini, the author examined microscopically the fat in the blood of infants just before, and at intervals of one-half hour for three hours following, a breast feeding. The sizes of the fat globules are classified as large, medium, small, very small and "powder-size." In babies with eczema, the size of the fat globules of the blood was larger than normally. Therefore, the author believes that the digestion of fatty substances in eczematous babies is impaired.

She deduces from her observations that the absorption of fat from the intestine is not a passive function, but an active secretion of the intestinal epithelium.

HIGGINS, Boston.

THE EFFECT OF COMBINATIONS OF VITAMINS ON EXPERIMENTAL INFECTION. W. PFANNENSTIEL and B. SCHABLAS, München. med. Wchnschr. **77**:649 (April 11) 1930.

The authors studied the effect of vitamins D and B separately and combined on experimental tuberculosis and skin infection with staphylococci. Rabbits, the diets of which had been supplemented by the addition of both vitamins in the form of irradiated ergosterol and dried yeast showed a greater resistance to infection with tubercle bacilli and staphylococci than rabbits fed a diet without any additional vitamin or those receiving a diet containing only one additional vitamin.

BRADLEY, Mount Vernon, N. Y.

THE APPEARANCE OF THE ELECTROCARDIOGRAM IN HEART LESIONS PRODUCED BY COD LIVER OIL TREATMENT. ERIK ACKERMANN and NILS STENSTROM, Acta pediat. **9**:229, 1930.

II. A study of the behavior of the myocardial lesions in albino mice after the cessation of cod liver oil medication: The authors had previously reported electrocardiographic and histologic evidence of cardiac damage in mice fed unlimited amounts of cod liver oil. In the present experiments they used as controls mice that had been treated with cod liver oil to the point of definite manifestation of cardiac injury, and kept the test animals on the basal diet without further cod liver oil in order to investigate the recovery process. The control animals all showed changes of the type previously described: pigment degeneration of cardiac muscle cells, vacuolization, sarcolysis, fatty infiltration, calcium deposition, intercellular edema, and in the ventricular wall as a whole a low degree of increase in connective tissue, in many cases with complete replace-

ment of muscle by fibrous tissue in small areas. With these anatomic changes were associated typical alterations in the electrocardiogram.

During the period of recovery in the test animals after the cessation of cod liver oil administration, evidence of anatomic and functional restitution was obtained. The authors failed, however, to observe a single example of complete recovery. The longest survival period without cod liver oil was seven and one-half months. In man it is suggested that these changes are not often observed because of rapid healing, but the possibility remains that cod liver oil may produce chronic cardiac disease.

III. The electrocardiogram in albino rats treated with cod liver oil: Rats were given from 0.5 to 12 cc. of cod liver oil per kilogram each day in addition to the basal diet. The dosage was accurately controlled by stomach tube administration. In comparison with mice, rats showed little electrocardiographic change. The anatomic changes were essentially of the same type as those reported in mice, except that pigment degeneration and marked fatty degeneration of cardiac muscle cells were not found. Quantitatively, rats showed considerably less cardiac damage. The early death of practically all of the experimental animals is ascribed by the authors to the effects of cod liver oil administration.

IV. The electrocardiogram in rabbits treated with cod liver oil: The plan of these experiments with rabbits was essentially the same as that previously reported with rats. Cod liver oil was fed by stomach tube in doses varying from 1 to 5 cc. per kilogram each day, and the observations were carried out over survival periods of from ten days to a little over four months. The principal functional evidences of cardiac injury were a slowing of ventricular rate and a prolongation of auriculoventricular condition time and of intraventricular conduction time; these changes sometimes appeared within a week after the commencement of cod liver oil administration. The anatomic evidences of damage to the heart, examples of which are reproduced in excellent photomicrographs, were of the same type as those reported in rats and mice, though myocardial hemorrhages were more frequent and the conducting system appeared to be particularly vulnerable. One animal died of a spontaneous rupture of the right ventricle.

V. The electrocardiogram in dogs treated with cod liver oil: The investigation of cardiac injury produced by cod liver oil administration was extended to dogs. Electrocardiographic changes, as in the case of rats, were relatively inconspicuous; they were detectable, however, within from two to four months from the commencement of the experiments. Clearcut anatomic changes, of the types previously described for other species, were brought out even by a dosage as small as 0.1 cc. of cod liver oil per kilogram each day. The authors point to the quantitative, and to a less extent to the qualitative, difference in the response of different types of experimental animals.

The reviewer has attempted to reproduce faithfully, though in brief form, the interpretations which the investigators themselves have put on their experiments. It is his own opinion, however, that owing to imperfections in the experimental control, some of which the authors frankly point out, one may not accept all of their conclusions without reserve. All of the articles are accompanied by excellent reproductions of electrocardiograms and photomicrographs.

McIntosh, Baltimore.

Nutrition

Nature and Rôle of Fatty Acid Essential in Nutrition. G. O. Burr and M. M. Burr, J. Biol. Chem. **86**:587, 1930.

In the rat, fat-free diets produce extensive, even fatal, renal degeneration. The disease resulting from fat-free diet is not cured by saturated fatty acids but by linoleic acid, either pure or in olive oil, lard, corn oil, egg lecithin, etc. The conclusion is reached that linoleic acid is essential in nutrition.

[Arch. Path.]

A Few Reflections on the Significance of the Term Rickets. Eric Pritchard, M. J. & Rec. **131**:446 (May 7) 1930.

The author believes that the confusion that exists at present in the minds of many on the symptomatology or etiology of rickets is due to the fact that no one has a clearcut definition of what the disease really is. He believes it to be a composite disease due not entirely to want of vitamin D, phosphorus, calcium or sunshine, but to a variety of factors. He also feels that pediatrists and dietetic specialists should make a determined attempt to differentiate between the symptoms of different combinations of food deficiencies. If this were done, the term rickets would cease to be a sort of comprehensive term to cover a multitude of different conditions.

Williamson, New Orleans.

The Identification and Significance of Hemolytic Streptococci in Milk. John C. Hardenbergh, New England J. Med. **202**:373 (Feb. 20) 1930.

Streptococci are divided into hemolytic and nonhemolytic, the hemolytic types —septic sore throat and scarlet fever—being of the greater importance. Several methods of identification of *Streptococcus epidemicus* and *Streptococcus scarlatinae* are explained. Milk is plated on blood agar from which the beta, wide hemolytic area, colonies, are transferred to a tube containing washed rabbit's cells to obtain the degree of hemolysis. Next the p_H is determined; if it is 4.5 or 4.6 the culture is not *S. epidemicus,* which has a p_H of 4.8 or more. Further evidence to determine the presence of *S. epidemicus* is learned by the sodium hippurate test which is based on the splitting or hydrolysis of sodium hippurate to a clear solution. Because *S. epidemicus* is encapsulated, the presence of the capsule is made visible by an india ink preparation. *S. epidemicus* ferments lactose, saccharose and salicin but not mannite. The streptococcus mentioned is pathogenic for white mice in from seven to forty-eight hours.

S. scarlatinae has a smaller capsule than *S. epidemicus* and is gram-positive; its colonies are smaller, less sharply raised, less mucoid, and they attack dextrose, lactose, saccharose, salicylates and coagulated milk. It has a p_H of 5 or more.

The hemolytic streptococcus is of greatest significance when the cow's udder acts as a secondary host, when great multiplication of the streptococci occurs. Properly pasteurized milk does not allow enough streptococci to pass to cause many cases of disease in human beings.

The examination on blood agar plates of the milk of all new cows admitted to a herd and periodic tests of the old cows' milk will do much to discover and eradicate streptococci from milk.

Gengenbach, Denver.

The Value of Cod Liver Oil for Underpar Children of School Age. Arthur D. Holmes and Hanna L. Ackerman, New England J. Med. **202**:470 (March 6) 1930.

Twenty-eight school children between 6 and 17 years of age, suspected of having tuberculosis, were selected as subjects to determine to what extent cod liver oil is indicated in the treatment for incipient tuberculosis in school children. The group was divided into (*a*) contact cases, (*b*) arrested cases, (*c*) cases of more or less active tuberculosis and (*d*) cases showing daily fever. Each child was given nearly three fourths of an ounce of cod liver oil each day. The oil was a blend of 50 per cent Newfoundland, 45 per cent New England and 5 per cent Canadian products; it contained 1,250 vitamin A units and 100 vitamin D units per gram. The average period of treatment was twenty-six weeks. All the children gained, on an average, 6.7 pounds (3039 Gm.) in weight in the twenty-six week period. This is 3.5 pounds (1587.5 Gm.) greater than the normal rate of growth. Temperatures above 100 F. were noted in 30 per cent of the cases. A greater number were absent from school who had not cod liver

oil therapy. The regular administration of cod liver oil in patients with incipient tuberculosis probably is not the only source of improvement in health, but it is an important factor.

GENGENBACH, Denver.

ESSENTIALS VERSUS NON-ESSENTIALS IN MILK SANITATION. PAUL B. BROOKS, New England J. Med. **202**:582 (March 20) 1930.

The author recommends the addition of essential, and the removal of the unessential, requirements in milk sanitation. In New York state, exclusive of New York City, a thirteen year period beginning in January, 1917, revealed eighty-nine outbreaks of milk-borne communicable and gastro-intestinal diseases. The diseases included diarrhea in infants, tuberculous infection in children, communicable diseases at all ages and undulant fever. Because only two of the eighty-nine outbreaks were attributable to pasteurized milk, the suggestions for guarding against milk-borne disease refer to raw milk only. The sources of infection were found to be milk handlers with the active disease, milk handlers acting as carriers of the germ but not ill, and mastitis in the cow. These disease-producing factors could be reduced materially by safety measures carried out by the close cooperation of the producers and the local health officers. The elimination of cases of mastitis, the examination and treatment of all ill persons or stock on the farm or plant and proper precautions against carriers would involve a moderate expense but not as great as the loss to consumer and producer caused by frequent outbreaks of illnesses. The elimination of the regulations that deal with quality rather than safety would reduce the cost of production appreciably. It is doubtful if raw milk, after all precautions, can replace properly pasteurized milk from the standpoint of safety.

GENGENBACH, Denver.

CONSTIPATION IN CHILDREN: A NOTE ON THE TREATMENT BY USE OF A RESIDUE-FREE DIET. RICHARD M. SMITH and HENRY E. GALLUP, New England J. Med. **202**:802 (April 24) 1930.

Constipation as considered in this article refers to that type of bowel movement which occurs only following the use of regular cathartics, suppositories and enemas. With true constipation, symptoms of greater or lesser importance often occur. Among these are abdominal pain and vomiting, followed by acidosis, loss of weight and poor posture. Examination reveals slight abdominal distention, tenderness and sometimes fecal masses in the colon. The conventional treatment by anticonstipation diet, cathartics and enemas relieves this condition temporarily. To obtain permanent results, treatment must be directed at the underlying cause of the constipation. This is best accomplished when there is a clear conception of the physiology and normal function of the lower bowel. True coordinated peristaltic waves eventually force food into the lower colon from below upward, the rectum being empty until just before defecation. If no response is made to the initial stimulus, distention is facilitated and evacuation made more difficult, resulting in fecal masses clinging to the wall and true constipation. This situation can be verified by roentgen studies. Constipation due to disturbed function of the colon can be corrected by a low residue diet, the liberal administration of mineral oil in small doses after each meal, the temporary use of a weekly cathartic and the cautious use of soap suds enemas for a few weeks. All measures should be gradually discontinued as improvement ensues and diet modified to higher residue-producing foods. Therapy may have to be carried out for several weeks. Three case reports illustrate the advantages of this mode of treatment over the large-residue diet.

GENGENBACH, Denver.

THE TOXICITY OF IRRADIATED ERGOSTEROL. J. B. DUGUID, M. M. DUGGAN and J. GOUGH, J. Path. & Bact. **33**:353, 1930.

Viosterol is more toxic for rats fed on a synthetic vitamin-free diet of high calcium content than for rats fed on a normal diet of bread and potatoes. In

preparing a synthetic diet for use in investigating the toxicity of viosterol, attention must be paid to the calcium content of the diet. Should casein be used in the diet, precautions must be taken to ensure that the calcium content of the casein does not unduly raise the total calcium content of the diet.

AUTHORS' SUMMARY.

THE PHOSPHATEMIC CURVE OF THE NORMAL AND RACHITIC ORGANISM. J. WARKANY, Ztschr. f. Kinderh. **48**:654, 1930.

All experimental animals treated with irradiated ergosterol reacted promptly with a rise in the phosphatemic curve which was not lasting and with a gradual diminution of vitamin D in the body to the starting value after about three weeks. It was assumed that this gradual diminution in the height of the curve was to be referred to a slow removal of excess vitamin D from the organism. Whether this removal followed a destruction or an excretion could not be determined. In both cases one could assume the process to be a defensive mechanism against an unnatural condition of hypervitaminosis. Renewed exhibition of irradiated ergosterol resulted in a very short time in increase of the phosphatemic reaction again. Accordingly, this reaction makes it possible not only to demonstrate an increase of the amount of vitamin D, but also the removal of the excess. These experiments gave further evidence for the assumption made in this communication that the changing of the phosphatemic reaction is an index of the changing of the amount of vitamin D.

EMERSON, Boston.

Prenatal Conditions

RADIOGENIC MICROCEPHALY: A SURVEY OF NINETEEN RECORDED CASES WITH SPECIAL REFERENCE TO OPHTHALMIC DEFECTS. LEOPOLD GOLDSTEIN, Arch. Neurol. & Psychiat. **24**:102 (July) 1930.

It has been demonstrated that pelvic irradiation during pregnancy may cause microcephaly. Of the nineteen microcephalic feebleminded children irradiated in utero who were studied with special reference to ocular defects, twelve exhibited more or less serious abnormalities of the eyes. Microphthalmia, optic atrophy and congenital amaurosis were the most commonly observed disturbances. Although defects of the optic apparatus have been observed in nonradiogenic microcephaly, it is believed that the increased frequency, severity and uniformity of the defects observed in the radiogenic form point clearly to irradiation as the specific cause.

BEVERLY, Chicago.

MECONIUM PERITONITIS FROM SPONTANEOUS PERFORATION OF THE ILEUM IN UTERO. W. SCLAIR BOIKAN, Arch. Path. **9**:1164 (June) 1930.

A case of meconium peritonitis due to a perforation in the lower ileum is reported. At the site of perforation were: excessive development of lymphatic tissue, deeply penetrating crypts of Lieberkühn which rested directly on the muscularis, a local sharply circumscribed absence of the longitudinal muscular layer, marked thinning of the circular muscular layer and cystic dilatation of the glands of the mucosa reflected about the perforation. Below the perforation was a large amount of lymphatic tissue with deeply penetrating crypts of Lieberkühn, which here also rested directly on the muscularis.

The sequence of events is conceived to be as follows: Primarily there was a persistence of fetal antimesenteric diverticula. In response to this, excessive lymphatic tissue developed, which caused pressure atrophy of the muscularis. Peristalsis ruptured this local area of diminished resistance. The cystic character of the glands is attributed to the inflammatory processes in the peritoneum.

The literature is reviewed with reference to the etiology of meconium peritonitis.

AUTHOR'S SUMMARY.

A Congenital Polycystic Kidney Duplex. Frank H. Washburn, New England J. Med. **202**:657 (April 3) 1930.

The author submits a photograph of an autopsy specimen of congenital polycystic kidney duplex. The case was reported in the *Journal of Urology*.

Gengenbach, Denver.

Congenital Melanotic Sarcoma in an Infant. E. Parkes Weber, E. Schwarz and R. Hellenschmied, Proc. Roy. Soc. Med. **23**:822 (April) 1930.

An infant, aged 8 months, was admitted to the hospital because the liver was felt to be enlarged, with tumor-like nodules. She lived for nine weeks after admission. A specimen of the liver showed melanotic sarcoma. The child had been delivered by cesarean section, and the placenta was found to be melanotic. Eighteen months before the delivery of the child the mother had been operated on for melanotic sarcoma of the thigh.

Williamson, New Orleans.

Coarctation of the Aorta. W. G. Wyllie, Proc. Roy. Soc. Med. **23**:839 (April) 1930.

A case of coarctation of the aorta is reported in a girl aged 5½ years.

Williamson, New Orleans.

Congenital Pulmonary and Mitral Stenosis. A. G. Maitland-Jones, Proc. Roy. Soc. Med. **23**:836 (April) 1930.

A girl, aged 11 years, was noticed by the mother to be cyanotic. The condition had appeared during the three years preceding examination. She complained of pains in her joints from time to time. She had always been subject to colds and sore throats. For the last two years she had complained of pains in her chest accompanied by blueness. The apex beat of her heart was in the fifth interspace three fourths of an inch (1.9 cm.) external to the midclavicular line. In the pulmonary area a systolic thrill was felt and a systolic murmur was heard. At the apex presytolic and systolic murmurs were heard. An orthodiagram showed the heart enlarged to the left and the right. An electrocardiogram showed right ventricular preponderance and a delayed P wave.

Williamson, New Orleans.

Acute Infections

The Circulatory Failure of Diphtheria: II. The Carbohydrate Metabolism in Diphtheria Intoxication. Francis F. Schwentker and William W. Noel, Bull. Johns Hopkins Hosp. **46**:259 (April) 1930.

Twenty-one rabbits received subcutaneous injections of graded doses of diphtheria toxin, so that death occurred in from seventeen hours to five and one-half days. Blood sugar was determined daily or at more frequent intervals, and in a few of the animals the liver and the muscles were analyzed for glycogen.

It was found that there was a primary increase in glycogenolysis in the first stage of the toxemia and a resultant rise in blood sugar. Later, in severe cases there was marked hypoglycemia. In the animals that lived longer, there was a decrease in glycogenesis owing probably to a suppression of the production of insulin with a resultant hyperglycemia. The liver and muscles show a marked diminution in glycogen content.

The authors conclude that the symptoms of diphtheria intoxication are due in large part to secondary nutritional disturbances in all of the essential body tissues. The administration of insulin causes the assimilation of the dextrose.

Lyttle, New York.

SCARLET FEVER PROPHYLAXIS: USE OF BLOOD SERUM FROM PERSONS WHO HAVE RECOVERED FROM SCARLET FEVER. F. M. MEADER, J. A. M. A. **94**: 622 (March 1) 1930.

The authors gave 7.5 cc. of pooled blood serum from patients who had had scarlet fever within a year to 450 contacts; scarlet fever developed in 2.9 per cent of the contacts and in 12.8 per cent of a control group. Apparently about 85 per cent were protected from the disease. The immunity probably does not last longer than three or four weeks, and it is especially valuable for young children and for infirm persons. This method has been useful in checking outbreaks in institutions.

BONAR, Salt Lake City.

THE PROGNOSIS OF TETANUS. JOSEPH K. CALVIN and A. H. GOLDBERG, J. A. M. A. **94**:1977 (June 21) 1930.

The mortality from tetanus at the Cook County Hospital remained unchanged in the past fifteen years in spite of the fact that in the last five years larger amounts of antitoxin were used and intraspinal administration was more frequent. The incubation period was under ten days in 50 per cent of the cases. The mortality was 84 per cent in those with an incubation period of less than ten days, and 25 per cent in those having an incubation period of from fourteen to twenty one days. The deaths were greatest on the second and third days. The statistics do not show that antitoxin appreciably affects the mortality, no matter how it is given. Prophylactic inoculations reduce the mortality markedly if tetanus develops. The high mortality of tetanus in spite of specific therapy emphasizes the tremendous value of prophylactic inoculations in any cases of injury in which tetanus is likely to develop.

BONAR, Salt Lake City.

MEASLES PROPHYLAXIS. L. H. BARENBERG, J. M. LEWIS and W. H. MESSER, J. A. M. A. **95**:4 (July 5) 1930.

The most effective prophylactic measure against measles is the serum of convalescent patients, but its application is limited because of its lack of availability. The most practical method of prophylaxis is the use of the blood of normal adults who have had measles. This brings about an attenuated form of the disease. The authors failed to confer protection or to modify the disease by means of immune goat serum.

BONAR, Salt Lake City.

WHOOPING COUGH: EARLY DIAGNOSIS BY THE COUGH PLATE METHOD. LOUIS W. SAUER and LEONORA HAMBRECHT, J. A. M. A. **95**:263 (July 26) 1930.

The cough plate method is the best means of the early diagnosis of whooping cough, for with this method the disease can now be diagnosed before the lymphocytosis and the whoop. An analysis of 200 cases seen in private practice shows that the plate was positive in all but 1 of 53 cases in the catarrhal stage, in 70 of 107 in the paroxysmal stage and in none of 40 in the period of decline. The chief value of an early diagnosis is that exposed children may be quarantined before they expose others.

BONAR, Salt Lake City.

THE INTRA-UTERINE TRANSMISSION OF TYPHOID. ELIHU S. WING and DANIEL V. TROPPOLI, J. A. M. A. **95**:405 (Aug. 9) 1930.

Cases of intra-uterine transmission of typhoid have been reported, but there have been none in which the mother convalescing from typhoid gave birth to a convalescing baby with positive stools and a positive Widal reaction. The case reported by the authors gives additional weight to the theory that the fetus produces its own agglutinins.

BONAR, Salt Lake City.

DIPHTHERIA PREVENTION IN BROOKLINE. FRANCIS P. DENNY, New England J. Med. **202**:716 (April 10) 1930.

From 1905 to 1923 the average annual cases of diphtheria in Brookline, Mass., numbered 52, with 2.2 deaths. A circular letter of information relative to diphtheria and its prevention sent out from 1923 to 1929 resulted in the prophylactic treatment of 6,115 school and preschool children. Education in the way of public meetings, public health nurses, movies and pamphlets is of great assistance in convincing parents that protection against diphtheria is important. There were 288 cases and 11 deaths during the six years before the protective campaign of 1923, and 51 cases and no death during the six subsequent years. Almost all the cases after 1923 were in the unprotected group. With a low diphtheria rate, physicians are apt not to take as many cultures, which may lead to unnecessary disaster. In seven years the total amount expended by Brookline, a city of 40,400, for the campaign was $4,010.

GENGENBACH, Denver.

RHEUMATIC FEVER IN CHILDREN: ITS CLINICAL ASPECTS. ALBERT D. KAISER, New York State J. Med. **30**:325 (March 15) 1930.

From 8 to 10 per cent of the school children of Rochester, N. Y., showed some evidence of acute rheumatic infection, if all manifestations of the disease are included; 2.5 per cent had acute rheumatic fever; growing pains were found in 7 per cent, chorea in 0.5 per cent and heart disease in 2.6 per cent.

In order to show the results of tonsillectomy, a survey was made in Rochester of 20,000 tonsillectomized children between the ages of 5 and 15 years. These were compared with a control group of 20,000 children whose tonsils had not been removed.

In the tonsillectomized group, 399 children developed rheumatic fever; 630 in the control group had growing pains, while 1,530 of those not operated on gave this symptom.

Chorea occurred in 85 in the tonsillectomized, against 75 in the control, group; heart disease was found in 450 compared with 595, and scarlet fever in 1,524 compared with 3,270 untreated children.

Once rheumatism or chorea has developed, recurrent attacks are only slightly influenced by removal of the tonsils. The same is true of heart complications.

There is a marked reduction of sore throats in the children operated on. Tonsillectomy is shown to lessen the incidence of acute rheumatic fever if practiced before or at the appearance of the minor manifestations of the disease; it is of much less value later.

AIKMAN, Rochester, N. Y.

A REPORT ON THE PROGRESS OF THE UPSTATE DIPHTHERIA PREVENTION CAMPAIGN TO DATE. HERMAN F. SENFTNER, New York State J. Med. **30**:331 (March 15) 1930.

The diphtheria prevention campaign in New York State, outside of greater New York, is now in its fourth year. It was estimated that over 1,000,000 children under 10 years of age should be immunized. So far, about one half of that number have received toxin-antitoxin. There has been a marked increase in the percentage of immunizations of children under 5 years of age, but this group still presents the greatest problem. The best results are obtained in small rather than large cities, and both the cases of diphtheria and the death rates in places with a population of over 10,000 have continued practically double those of places with less than 10,000 persons.

The best results are obtained by intensive drives. Constant follow-up work among children under 5 years of age is necessary for success. The results of the campaign are shown by a marked fall in the number of cases of diphtheria throughout the state.

AIKMAN, Rochester, N. Y.

REPORT OF A CASE OF PURPURA HÆMORRHAGICA FOLLOWING DIPHTHERIA. J. D. ROLLESTON and D. G. MACPHERSON, Proc. Roy. Soc. Med. **23**:821 (April) 1930.

On Dec. 16, 1929, a boy, aged 4 years, was admitted to the hospital suffering from faucial diphtheria. He had been sick for six days. On his admission, 24,000 units of antitoxin were given, and by December 23 the throat was clear. On December 24, suppurating cervical adenitis developed. On Jan. 8, 1930, otorrhea developed, bleeding took place from the mouth and pharynx and the stools were black. The next day there were generalized petechial hemorrhages and purpuric patches on the abdomen and in the loins, and a cantering rhythm developed in the heart. Death took place on the following day. Observations at autopsy accompany the case report.

WILLIAMSON, New Orleans.

PRESENT STATUS OF DIPHTHERIA PROPHYLAXIS. G. LAPIERRE, Arch. de méd. d. enf. **33**:263 (May) 1930.

Lapierre reviews the history of immunization against diphtheria and contrasts, with exhaustive statistical data, the various measures now employed.

Comparing toxin-antitoxin with anatoxin or toxoid, he finds that German and American clinicians largely favor the use of toxin-antitoxin, with successful results in from 80 to 85 per cent of their cases, while physicians in France, Austria, South America and Canada prefer the method of Ramon; this method consists of three injections, separated by intervals of two or three weeks, and seems to confer immunity on practically all children vaccinated. Lapierre was the first to adopt the use of anatoxin in Canada; in many thousands of cases he has not obtained a positive Schick test in children receiving the full treatment with toxoid, although he has encountered some rather severe reactions. Further methods of immunization, such as the cutaneous friction vaccination of Löwenstein, rhinovaccination as practiced by Ramon and Zoeller and vaccination by the digestive route as advanced by Breton and Petit, are mentioned with some approval. Lapierre urges the importance of health crusades everywhere to protect the preschool child from diphtheria and advocates compulsory ordinances to this end.

AMESSE, Denver.

UNEXPECTED DEATH IN AN INFANT CONVALESCENT FROM ERYSIPELAS. A. LUCCA, Riv. di clin. pediat. **28**:369 (May) 1930.

The patient was born on Dec. 28, 1928; erysipelas developed on Feb. 8, 1929. The infant was in the hospital until March 2, when it was discharged as convalescent and afebrile for four days. On the following day, signs of weakness, cyanosis, coldness of the extremities and dyspnea developed rapidly. On her readmission to the hospital, the child appeared to be in a desperate condition; she was prostrated, did not react to stimuli and had a continuous weak cry; the pulse rate was 170 and weak, the respiration 48 and superficial, the temperature 35.8 C. (96.4 F.) and the blood pressure 50 mm. of mercury. The child died six hours after the onset of the symptoms. At autopsy no lesions, even histologic, were found except evidence of recent bilateral hemorrhages involving both suprarenal capsules.

HIGGINS, Boston.

THE PURIFICATION OF ANIMAL VACCINE. R. GOMISHO, Arch. de hyg. **4**:175 (Jan.) 1930.

Using Gin's method of purifying animal vaccine, the author was able to reduce the bacteria present to 5,000 per cubic centimeter. Experimentally and chemically this gave maximum protection with minimum local reaction.

SANFORD, Chicago.

THE TREATMENT FOR DIPHTHERIA. C. LUZ, Arch. de pediat. **2**:539 (Feb.) 1930.

Luz briefly discusses the problem of diphtheria and pleads for sufficient doses of antitoxin to avoid the usual complications following the disease. He believes that 20,000 units is the minimum dose.

SANFORD, Chicago.

A CASE OF TETANUS IN THE NEW-BORN. M. DA ROCHA, JR., Arch. de pediat. **2**:546 (Feb.) 1930.

Typical symptoms developed at 11 days of age. The differential diagnosis lay between obstetric injury, cerebral hemorrhage and encephalitis. The treatment was 20,000 units of antitetanic serum, injections of magnesium sulphate, and chloral hydrate and phenobarbital to control the convulsions.

SANFORD, Chicago.

VACCINATION AGAINST DIPHTHERIA IN THE SCHOOLS OF MONTEVIDEO. RAFAEL SCHIAFFINO, Bol. Inst. internac. am. de protec. a la inf. **3**:674 (April) 1930.

Before antidiphtheria serum was used in Uruguay, the death rate for this disease was forty per hundred thousand inhabitants (1891-1895); in the following years it decreased until it reached in the period 1896-1920 the proportion of from four to five per hundred thousand inhabitants.

In 1929 the disease increased in extent and seriousness; there were 679 cases reported and 79 deaths in Montevideo. Faced with the alarm of the first months, the School Medical Board asked to be authorized by the Board of Education to begin the antidiphtheria vaccination campaign for the first time in Uruguayan schools.

The vaccine employed was prepared at the Institute of Hygiene according to Ramon's technic. It was applied in three doses of 0.5, 1 and 1.5 cc., at intervals of not less than three weeks. The number of children vaccinated was 7,750, that is, 15.5 per cent of the school population.

The Schick test was practiced among a limited number, and the results obtained show the need of the application of the three, if not the four, doses of vaccine. Dr. Rodrigues Lopez observed up to 20.6 per cent positive reactions after the third dose. This same fact was established by several cases of illness among children who had not received the three doses.

AUTHOR'S SUMMARY.

TETANY CONVULSIONS DURING PYURIA. F. BOLDT, Arch. f. Kinderh. **89**:281 (Feb.) 1930.

A girl, aged 9 months, suffered from a mild digestive disturbance and pyelocystitis. She was given albumin milk and methenamine. The temperature was intermittent and the condition slightly improved. Two weeks after the patient was admitted to the hospital, typical spasmophilic convulsions developed; the calcium content was 6.72, the phosphorus 2.33 and the C. O. C. 3.5. The administration of irradiated ergosterol was immediately begun and in one week the calcium content was 11.3, the phosphorus 2.28 and the C. O. C. 5 plus.

SANFORD, Chicago.

A SUGGESTION FOR THE TREATMENT IN MENINGITIS: LAVAGE OF THE SUBARACHNOID SPACE WITH THE AID OF A NEW PUNCTURE TECHNIC. E. HOLTZ, Arch. f. Kinderh. **89**:285 (Feb.) 1930.

The author reaches the subarachnoid space over the motor regions by way of the large fontanel. Six children have been treated in this manner; two with streptococcus, two with pneumococcus, one with *Bacillus coli* and one with pseudomeningococcus meningitis. He uses a vaccine or antitoxin serum in salt solution for the lavage. This method is especially indicated when the cisterna and the spinal canal are blocked by fibrin.

SANFORD, Chicago.

BACTERIOLOGIC AND SEROLOGIC INVESTIGATIONS IN DYSENTERY. F. SARTORIUS, Monatschr. F. Kinderh. **46**:481, 1930.

A review is given of over 200 articles on this subject which have appeared in recent years. It is of primary interest to the bacteriologist. The author discusses the cultural characteristics of the Shiga-Kruse bacillus and compares them with the characteristics of the host of organisms that are more or less related to this group that, at any rate, seem to be associated with clinical dysentery. The review covers the reactions of these organisms in a great variety of sugar mediums.

Apparently the Shiga-Kruse organism differs from many of the others in its failure to produce indol. The literature shows the resistance of the various organisms to external influences, such as duration of life outside the body, drying, temperature, chemicals and sunlight. The literature also presents the serologic differences and differences in toxin formation of the various organisms.

From this extensive review, the author concludes that there is still much to be learned.

GERSTLEY, Chicago.

RECENT DEVELOPMENTS IN DIPHTHERIA PROPHYLAXIS. E. LÖWENSTEIN Münchn. med. Wchnschr. **77**:883 (May 23) 1930.

The injections necessary for active immunization against diphtheria have been an obstacle to carrying out this procedure on a large scale in Europe. Even after this objection has been overcome, one cannot guarantee that in all children receiving toxin-antitoxin or toxoid immunity will develop. Löwenstein has used an ointment which contains dead diphtheria bacilli as well as diphtheria toxin. Guinea-pigs immunized with the ointment and control guinea-pigs were inoculated intra-ocularly with diphtheria bacilli. The immunized animals remained well, whereas in the control animals severe ocular infections developed. Immunization with the ointment has been tried in four institutions for children in Vienna with unusually good results. Although there was a steady increase in the morbidity of diphtheria in Vienna at the time, there was no diphtheria in two of these institutions for a year or in the other two for five months following active immunization with the ointment. In the preceding months each institution had an average of five or more cases of diphtheria a month. The ointment is rubbed on the skin three times at intervals of two weeks. Immunity apparently develops in a month. One investigator tested the treated patients with the Schick test after one year. All children between 1 and 3 years of age, 87.5 per cent of those between 3 and 6 years and 61 per cent of the adults gave negative reactions.

BRADDY, Mount Vernon, N. Y.

THE ACTION OF INJECTED BACTERIAL PROTEIN IN CHILDREN, WITH SPECIAL REFERENCE TO RHEUMATISM OF THE JOINTS. E. STETTNER, Ztschr. f. Kinder. **48**:623, 1930.

After intravenous injection of bacterial protein, as after injection of cocci, there followed fever, malaise, leukocytosis, neutrophilia, shifting to the left, lymphopenia and eosinopenia. Herpes was often seen. It is to be assumed that protein in suitable cases has a favorable influence. By the reaction a slumbering rhythm was awakened in which variations, covering about ten days, showed a course of two phases and had a particular significance for the course of many infections. The herpes occurred about the middle of the two phases and, by analogy to measles, it is suspected that only in the first phase can the process be stopped. If this assumption could be proved, it would be a piece of evidence for the basic importance of recognizing the time for therapeutic application.

EMERSON, Boston.

Dysentery Bacilli in the Vaginal Secretions of Young Girls. G. Chaskina-Munder, Ztschr. f. Kinderh. **48**:690, 1930.

Cultivation of dysentery bacilli from the genitalia of two of twenty-four girls examined shows that one has to consider this possibility in outbreaks of dysentery in institutions.

Emerson, Boston.

Intracutaneous Inoculation Against Smallpox. B. Bendix, Ztschr. f. Kinderh. **48**:694, 1930.

Four infants, aged 1 year, were inoculated with smallpox virus, diluted 1:500, intracutaneously on the forearm. From the fourth to the seventh day there were reactions of various sizes; in one infant there was redness and swelling to the elbow. From the eighth to the eleventh days there was a severe general reaction in all of the cases, with fever up to 104 F. This form of inoculation is not recommended even if prepared aseptically and standardized, especially in children with eczema, rickets or convulsions.

Emerson, Boston.

Encephalitic Phenomena in Whooping Cough. Wladimir Mikulowski, Acta pædiat. **9**:454, 1930.

The author believes that in whooping cough the blood contains a toxin that may affect the central nervous system and the vascular endothelium. He offers this explanation for the edema and hyperema of the brain sometimes found post-mortem and for the hemorrhages that occur in the skin, beneath the conjunctivae and elsewhere. In accordance with this view, he regards many of the features of the average case of whooping cough as due to encephalitis, whether changes in the spinal fluid are found or not, or to other effects of the toxin. Certain phases of the literature are discussed at length, but little original material is added. The argument is not convincing.

McIntosh, Baltimore.

Prolonged Form of Mesingococcus Sepsis. I. Lundholm and R. Stroman, Acta pædiat. **9**:518, 1930.

A girl, aged 1 year, had been taken ill at 11 months of age with a febrile attack suggesting at the time an influenzal bronchitis. She continued to have a hectic fever, however, and after the first week of illness showed successive crops of a maculopapular eruption. This state continued up to the time of her admission to the hospital.

In the hospital her temperature made a daily swing through 1.5 to 4.5 C. (2.7 to 8.1 F.) for several weeks. Early in the period of observation, meningococci were cultured from the blood stream, and antimeningococcus serum was given intramuscularly. Even after a sterile blood culture had been obtained, crops of papules continued to appear. These closely resembled the lesions of erythema multiforme except for the presence in some of them of a central petechial hemorrhage. The general systemic disturbance was not severe, nor were there any conspicuous physical observations aside from those already mentioned. In particular, the spleen was not enlarged nor were there any signs of meningeal irritation. The spinal fluid was examined two weeks after admission, but the results were entirely normal. Nonspecific as well as specific therapy was tried, without any definite results; but after a superimposed attack of acute pharyngitis about two months after admission and three months after onset, the fever disappeared rather suddenly and the child made an uneventful recovery.

McIntosh, Baltimore.

Epidemiology of Measles. K. Jonscher, Pedjat. polska **9**:131, 1929.

The control of measles epidemics depends on: (1) the use of the serum of convalescent patients, (2) a greater number of rooms for the sick, (3) spacious rooms in which the beds are sufficiently separated and (4) specially trained nurses.

Children up to 6 months of age have a natural immunity, although in many children at Posen University Clinic gastro-intestinal symptoms develop. It was also found that older children who have had measles may have catarrhal symptoms; they are great spreaders of infection.

KRUPIUSKI, Chicago.

Internal Diseases

RECENTLY DISCOVERED ENDOCRINE DISEASES. RUSSEL M. WILDER, Internat. Clin. **1**:293 (March) 1930.

Three disturbances of infrequent occurrence are discussed. The first of these is hyperepinephrinism. Symptoms are produced chiefly by tumors either from the cortical or chromaffin tissue of the suprarenals themselves or of accessory suprarenal glands. Tumors of the cortex produce precocious puberty in boys or masculine characteristics in girls. Cases of paroxysmal hypertension are reported. The clinical picture presented by these patients seemed to be like that produced by an injection of epinephrine. Complete disappearance of the hypertension and associated symptoms followed removal of the tumors.

The second disturbance described is hyperinsulinism. The symptoms produced by tumors of the islands of Langerhans were not different from those produced by an excessive dose of insulin, namely, faintness, tremor and blurred vision. They were associated with a definite hypoglycemia. Resection of the tumors suppressed the attacks. Occasional cases of hypoglycemia not associated with tumors occur. These may be associated with attacks of deliria and have been mistaken for hysteria, epilepsy and schizophrenia.

The third condition described is that of hyperparathyroidism. This is associated with an increased amount of calcium in the blood and an increased calcium excretion, which results in a negative calcium balance and a decalcification of the bones. Associated with the calcium change is a remarkable change in muscle tone and increased flaccidity of the muscles. A diffuse rarefaction involves practically all of the bones, but especially those of the pelvic girdle. Bending and fracturing follow. Definite improvement has followed the removal of parathyroid tumors.

MILLER, South Bend, Ind.

CHOLESTEROL OF THE BLOOD OF DIABETIC CHILDREN. PRISCILLA WHITE and HAZEL HUNT, New England J. Med. **202**:607 (March 27) 1930.

The authors present an investigation of faulty fat metabolism and its effect in 110 children with diabetes. In this article cholesterol has been assumed to be the total lipoid index. Lecithin and fatty acids are increased parallel with the cholesterol content of the blood. The normal upper limit of cholesterol is put at 230 mg. per hundred cubic centimeters.

Hypercholesterolemia and hyperglycemia do not go hand in hand any more than hypocholesterolemia and hypoglycemia. The postprandial peak of blood cholesterol is at the fourth hour. The increasing duration of the diabetes does not increase cholesterol content, but age seems to effect an increase. A diet more than 50 per cent above basal, fat 80 per cent of total calories, and weight more than 20 per cent above, and 10 per cent or more below, standard are followed by an increase in cholesterol content. Abnormalities of stature bear no relationship to cholesterol content. Acidosis and infections do not necessarily increase blood cholesterol. Diabetic coma is definitely associated with hypercholesterolemia. Patients with xanthoma diabeticorum following coma improved promptly when the amount of fat and of total calories was controlled. In those with pulmonary tuberculosis 50 per cent had an increase in cholesterol content. The average cholesterol recorded for children with diabetes who had gained tolerance after three years' duration was 184 mg., and for those not having gained tolerance 213 mg. From the data presented, it is impossible to say definitely whether the progress as regards complications and outcome depends on the amount of blood cholesterol or not, but new evidence to this end is presented.

GENGENBACH, Denver.

PREVENTION OF HEART DISEASE. WILLIAM H. ROBEY, New England J. Med. **202**:983 (May 22) 1930.

That an ounce of prevention is worth a pound of cure was never truer than in heart disease. In 1925 there were 200,000 deaths and in 1929 there were 225,000. With the exception of a few with congenital cardiac disease, all persons are born with normal hearts. These facts bring many of the ravages of heart disease within the realm of preventive medicine. Therapy applied to advanced cardiac pathology is of little lasting effect. It is of great importance to distinguish between true heart disease and functional disturbances, so that the patient may not be made an invalid unnecessarily.

Because there is usually an average period of four years from the onset of the disease to a condition of disability, much prevention could be exercised.

Diphtheria and scarlet fever are minor offenders in cardiac disease. In the third, fourth and fifth decades of life the organisms of the rheumatic groups are responsible for much cardiac disability. Growing pains, sore throats with vague nervous symptoms, rheumatic nodules, swollen tender joints, unexplained fever with stomach pain, nausea, vomiting or epistaxis and occasionally purpura or erythema multiforme must be regarded as possible danger signals for later heart lesions.

Foci of infection, often in the tonsils, should be eradicated promptly. This can be done even during the height of the fever and when the joints are inflamed. Teeth are often sources of infection.

Syphilis should always be ruled out in questionable cases. The failure of diagnosis of this disease is usually due to the fact that the physician does not suspect the condition. Arteriosclerotic heart disease can be prevented for a longer period by regular physical examinations.

Every child represents a case of potential heart disease and should be treated as such rather than later as a cardiac cripple.

GENGENBACH, Denver.

ENURESIS. D. W. WINNICOTT, Proc. Roy. Soc. Med. **23**:255 (Jan.) 1930.

There are two main groups of patients with enuresis: In the first group there is increased sensitivity of the urinary tract, with increased frequency or urgency, or both, of micturition, the urgency leading to enuresis. This is a manifestation of the anxiety state which also accounts for the frequently associated polyuria. Clinically, the children are often overexcitable and restless, and probably exhibitionism is important in some cases. The symptoms here are associated with unconscious phantasies, not necessarily dealing with micturition sensations, but properly belonging to masturbation sensations; the anxiety arises from the sense of guilt that accompanies the unconscious masturbation phantasies in these children. In children of the second group the enuresis, more usually nocturnal, accompanies phantasies of micturating, a revival of real or phantasied sensations of infancy, characteristically in relation to some person or situation closely associated with such a person. In this group there is typically no increased urinary tract sensitivity, and it is in these cases that many observers have reported anesthesia.

Clinically the two groups overlap. Children of the first group are brought to the doctor for fidgetiness, overexcitability and chorea, as often as for the urinary symptoms. Those of the second group are usually brought for the enuresis. In each group there may be associated disturbance in defecation. In the first group this usually takes the form of periodic abdominal colic, increased urgency of defecation or diarrhea. Such symptoms are fairly common, and occur as anxiety symptoms apart from urinary symptoms. In the second group there may be, but much more rarely, incontinence of feces. It may be possible here to demonstrate anal anesthesia. This disturbance in defecation always indicates severe emotional disorder. Enuresis is one of many symptoms which imply in a patient some degree of failure to reach, without damage to the personality, the full genital phase in emotional development. It is so frequent that one must postulate that some degree of this failure is common, a fact already well known. Dr. Winnicott illustrated his paper by cases described in detail.

WILLIAMSON, New Orleans.

FACIAL LIPODYSTROPHIA WITH UNERUPTED UPPER CENTRAL INCISOR TEETH. F. PARKES WEBER and O. B. BODE, Proc. Roy. Soc. Med. **23**:604 (March) 1930.

A girl, aged 8, had the typical "skin and bone" facies of so-called lipodystrophia progressiva. To a lesser degree there was deficiency of subcutaneous fat over the upper part of the thorax and shoulders. The upper central incisor teeth were unerupted, but the unerupted teeth could be seen in the roentgenogram. The condition was first noted at the age of 4½.

WILLIAMSON, New Orleans.

GASTROMEGALY IN A CHILD AGED TWO YEARS. REGINALD MILLER, Proc. Roy. Soc. Med. **23**:823 (April) 1930.

In a premature infant (eight months) weighing 4½ pounds (2,041 Gm.), projectile vomiting was present for the first two months; it ceased after this time, however, and she took her food well. At 17 months of age she weighed 13 pounds and 6 ounces (6,066.7 Gm.), and at 2 years, 13 pounds and 13½ ounces (6,279.3 Gm.). The abdomen was always large but was not regarded as abnormal. On her admission to the hospital, the patient was small and thin but complained of no pain. Roentgen examination showed a distended stomach passing far to the right and hiding the duodenal cap. There was a large food residue at seven and one-half hours. The colon was voluminous and a barium enema of two pints was easily given. The report is accompanied by a roentgenogram.

WILLIAMSON, New Orleans.

FIBROCYSTIC DISEASE OF THE UPPER END OF THE HUMERUS. CECIL P. G. WAKELEY, Proc. Roy. Soc. Med. **23**:826 (April) 1930.

A patient, aged 3¼ years, was admitted to the hospital on account of pain and loss of power in the right shoulder which had come on suddenly while the child was playing on the floor. On examination thickening of the upper part of the right humerus and definite wasting of the right deltoid were seen. Movements were limited. Roentgen examination showed a clear area with well marked borders limited to the upper end of the humerus and not traversing the epiphyseal line. There was some trabeculation across the cyst, and a line of fracture could be seen. A slight periosteal reaction was observed.

WILLIAMSON, New Orleans.

EXOPHTHALMIC GOITRE. W. G. WYLLIE, Proc. Roy. Soc. Med. **23**:830 (April) 1930.

The author reported a case of exophthalmic goiter in a girl, aged 9 years. Exophthalmos of the right eye was first noticed when the child was 6½ years of age. Details of examination of her present state are given.

WILLIAMSON, New Orleans.

INTRABRONCHIAL INJECTIONS OF IODIZED POPPY SEED OIL IN THE INFANT. P. F. ARMAND-DELILLE and J. LEUNDA, Presse méd. **38**:378 (March 15) 1930.

The authors describe their special cannula for the injection of iodized poppy seed oil 40 per cent. The operator injects a 10 per cent solution of cocaine into the larynx, and after an appropriate time he inserts the cannula. He then injects from 2 to 5 cc. of a 1 per cent solution of cocaine and follows this with from 5 to 20 cc. of iodized oil heated to 40 C. Finally, the total quantity of from 10 to 30 cc. of iodized oil, depending on the size of the infant, is injected. Roentgenograms can be made in ten minutes.

SANFORD, Chicago.

SEVERE ANEMIA AND HEMORRHAGIC DIATHESIS COMPLICATING CELIAC DISEASE (MALADIE DE HERTER-HEUBNER). B. STRANDQUIST, Rev. franç. de pédiat. **5**:728 (Dec.) 1929.

Strandquist discusses the anemia occurring in celiac disease in its relation to the whole disease picture, and suggests that it may be due to avitaminosis or faulty absorption from the gastro-intestinal tract. The tendency to hemorrhage sometimes observed in these cases may also be dependent on a lack of vitamin C. In other cases it seems to depend on certain biologic-chemical alterations of the blood plasma. In the latter type the prognosis is particularly poor. Strandquist reports a case of this kind, in which the tendency to hemorrhage was observed first when the child was 5 years of age; in spite of temporary periods of improvement, during which the child's general condition and blood picture were practically normal, he died ten months later from an uncontrollable nasal hemorrhage. Blood transfusion at this time was without avail.

LESLIE, Evanston, Ill.

OBSERVATIONS AND HISTOLOGIC OBSERVATIONS ON THE KIDNEY IN A CASE OF RENAL CALCULUS IN A BOY AGED EIGHTEEN MONTHS. G. BELLONI, Riv. di clin. pediat. **28**:384 (May) 1930.

This child, aged 18 months, had suffered for ten months from attacks of diarrhea, vomiting, fever (38.5 C. [101.3 F.]) and irritability; these attacks dated back to an attack of measles, and did not seem to affect the appetite; on admission to the hospital he had edema of the legs. Aside from a few casts, the urine was essentially normal. Suddenly, one day, he had a high fever, vomiting, increased edema, nystagmus, clonic muscular twitching and dyspnea; he passed into coma and died of uremia.

At postmortem examination a uric acid stone, the size of a large pea, was found free in the pelvis of the left kidney; there was also acute glomerular nephritis and tubular congestion and degeneration of both kidneys.

The author emphasizes that the case is unique in that a child aged 18 months had a renal calculus with only gastro-intestinal symptoms.

HIGGINS, Boston.

THYMIC ASTHMA. A. BARBOZA, Arch. de pediat. **2**:581 (April) 1930.

A new-born infant presented the classic symptoms of thymic asthma: stridor and attacks of asphyxia with cyanosis. The thymus was not percussable, but was shown by roentgenograms. Immediate relief was given by epinephrine, and two roentgen exposures caused the disappearance of all symptoms.

SANFORD, Chicago.

ESSENTIAL NOCTURNAL ENURESIS. M. DA ROCHA, Arch. de pediat. **2**:585 (April) 1930.

The author reviews the various etiologic factors involved in essential nocturnal enuresis and their relative frequency. Treatment is discussed in full, and the author of each procedure is given.

SANFORD, Chicago.

A CASE OF DIABETES IN A CHILD. MIGUEL ECHEGARAY, Bol. de la Soc. Catalana de pediat. **1**:23 (April) 1928.

The question is raised why diabetes, a supposedly hereditary disease, is found so infrequently in infants. The author reports a case of diabetes in a child aged 11 years, peculiar in that for six years after the discovery of definite diabetes the child developed normally without dietary or insulin treatment. The author believes that the reason so few cases are found in infancy is that urinalysis is not a routine measure. He believes that many deaths assigned to meningitis are really due to diabetic coma.

WATSON, Chicago.

PRACTICAL NOTES. K. WALTNER, Monatschr. f. Kinderh. **47**:24 (May) 1930.

A few practical suggestions from Waltner's clinical experience are offered.

In infections of the mouth of the infant he finds the application of a 0.5 per cent solution of gentian violet valuable.

In taking blood for a Wassermann test he recommends the cubital vein. He varies the technic by not attempting to aspirate blood from the vein. The skin is punctured, the needle is thrust into the vein, and the blood escaping from the vein through the punctured skin is aspirated into the syringe.

In cases of weeping eczema, he tries to dehydrate the body with organic mercury compound or mersalyl in injections of from 0.3 to 0.5 cc. If diuresis follows, as shown by a loss of weight, the injection can be repeated every second or third day from three to five times. If no loss of weight results, a second injection is useless.

In erysipelas he noticed that the subcutaneous injection of 0.3 cc. of a pituitary solution (extract of hypophysis) caused the redness to fade for a period of one to one and a half hours. No effect on the course of the disease was noticed.

GERSTLEY, Chicago.

HELMINTHIASIS, ESPECIALLY IN CHILDHOOD: A REVIEW OF THE LITERATURE, 1928-1929. H. BRÜNING, Monatschr. f. Kinderh. **47**:28 (May) 1930.

A comprehensive review of approximately 150 current articles on helminthiasis is given.

Investigations as to the susceptibility of intestinal worms to roentgen rays are inconclusive. Likewise nothing definite has come of complement-fixation tests.

The literature on allergy is extensive, but a skin test has not as yet proved satisfactory. Jadassohn, however, has shown that injections of a minute quantity of a worm extract will produce asthma and urticaria in susceptible persons. Eighty per cent of all subjects between 2 and 40 years respond with an immediate urticarial wheal to intracutaneous injection. Infants do not show such reactions, probably because they have not as yet created any antibodies.

The frequency of worms varies geographically. Reports from Riga show 28 per cent of examinations of the stool (1,103 cases) positive, from Argentina 24 per cent, from the Philippines 92 per cent and from China from 80 to 90 per cent. A series of 237 examinations in Philadelphia showed 26.5 per cent positive.

The greatest frequency occurs between 10 and 13 years of age.

Roentgenograms may help in diagnosis by revealing shadows or certain motor disturbances of the small intestine. The diagnosis can sometimes be made by observing a specimen of stool in a 15 cm. glass tube. The dying parts of the tapeworm come to the surface as grayish-white flecks, the size of a bean, which under the microscope show many eggs.

All writers are agreed as to the presence of eosinophilia. This is believed to be caused by an aldehyde produced by the worms. The clinical symptoms described by these writers would fill a textbook; they vary from epilepsy to peritonitis and anemia.

In spite of the great variety of remedies the writer believes oil of chenopodium to be the best. This may be toxic and so should be used with care. A good-sized dosage would be 3 drops, three times daily for eight days, i. e., a total of 72 drops.

GERSTLEY, Chicago.

CONGENITAL MALIGNANT NEOPLASM OF THE LIVER. F. PARKES WEBER, E. SCHWARZ and H. HELLENSCHMIED, München. med. Wchnschr. **77**:624 (April 11) 1930.

Tuberculous infection in utero from a tuberculous placenta has been recognized. However, congenital transmission of a neoplasm from the placenta has not been recorded. The authors report a case in which a malignant melanoma was trans-

mitted from the mother to the offspring either before or during delivery. The mother had numerous melanomas in the subcutaneous tissue. The delivery was by cesarean section. There were numerous melanotic nodules in the placenta. The mother died three months post partum. The infant was apparently well at birth. At 8 months of age, an enlarged nodular liver was palpable. The child became increasingly cachectic and died at 11 months of age. Autopsy revealed melanotic tumors in the liver, lymph nodes, lungs and subcutaneous tissue.

BRAHDY, Mount Vernon, N. Y.

ASCARIASIS AND SUPPURATIVE PLEURITIS. E. JENNY, Schweiz. med. Wchnschr. **60**:266, 1930.

A suppurative pleural effusion that contained eggs of ascarides developed on the right side in a boy, aged 16 months, who had ascariasis. In the course of three months the boy recovered completely. The development is explained as follows: Ascarides entered the liver by way of the choledochus. On the surface of the liver they caused an abscess, which perforated through the diaphragm into the pleural cavity. But it is also possible that the pleural ascaris invasion resulted from a lung stage in the development of the parasites.

[ARCH. PATH.]

THE SIGNIFICANCE OF LATERAL EXAMINATION BY X-RAYS FOR PNEUMONIA AND PLEURITIS IN CHILDHOOD. M. DEMANT, Ztschr. f. Kinderh. **48**:598, 1930.

The taking of lateral roentgenograms is simple, is possible even with incomplete apparatus, is useful and makes it more easy to diagnose swollen bronchial glands, interlobar pleuritis, pneumothorax and processes confined to one lobe.

EMERSON, Boston.

A CASE OF LYMPHOSARCOMA WITH A TERMINAL PICTURE OF LEUKEMIA. A. LANDAU, Ztschr. f. Kinderh. **48**:614, 1930.

A case is reported which is of interest as a contribution to the question of the close relation between lymphosarcoma and lymphatic leukemia. A thin, pale boy, aged 5 years, was admitted to the hospital with a history of gradually increasing cough, dyspnea and general weakness, without fever, for several weeks. The greater part of the left lung showed dulness on percussion in front and behind, and the breathing was diminished and bronchial. The tense abdomen showed a fluid wave, shifting dulness and a palpable spleen. There were lymph glands the size of a pea in the neck, axillae and groins, many the size of a bean above and below the left clavicle and one the size of a hazel nut in the left axilla; in the last three locations the glands were harder than in the other places. Examination of the blood showed hemoglobin 88 per cent, red blood cells 5,200,000 and white blood cells 13,000. A puncture of the pleural cavity yielded 70 cc. of yellowish-brown exudate with numerous lymphocytes. The culture was negative for growth, and injection into a guinea-pig gave no result. A section of the axillary gland revealed a lymphosarcoma. Roentgen treatment resulted in great improvement during the following months, but the child again became worse and showed metastases to the skin, the glands in the neck, the parotid region and the throat. His bones were sensitive and he had a tendency to bleed. The gums were red and swollen, and the teeth loose. There were ulcers in the mouth, the liver and spleen became enlarged and ascites reappeared. The blood now showed hemoglobin 23 per cent, red blood cells 1,500,000, white blood cells 56,000 and 87 per cent lymphocytes. Death followed. The case was a combination of lymphosarcoma, represented by the macroscopic tumor formation, and of a lymphocytic infiltration of the parenchymatous organs.

EMERSON, Boston.

THE QUESTION OF LYMPHOGRANULOMATOSIS. N. M. NICOLAEFF and I. W. ZIMBLER, Ztschr. f. Kinderh. **48**:678, 1930.

At the age of 3 years the child had dry pleurisy and peribronchitis, and later a swelling of the glands in the right side of the neck. At 5 years, examination of the blood showed hemoglobin 59 per cent, red blood cells 3,840,000 and white blood cells 4,500. Six months later he was admitted to the hospital, the tumor in his neck gone as a result of roentgen treatment, but the process generalized. He was pale, thin and weak. The glands in the axillae and groins were hard and painful, the liver hard and large, and the spleen knobby and painful, reaching 8 cm. below the costal margin. His temperature was from 102 to 103 F. He had pain in the abdomen and mild edema. The Pirquet reaction was negative. There were dulness and râles in the lungs. Blood culture showed streptococci; the red blood cells numbered 980,000, white blood cells 1,900 and hemoglobin 10 per cent. He died two months after admission. Anatomic diagnoses were: lymphogranulomatosis, pleurisy with effusion on the right side, bronchopneumonia, hyperplasia nodosa of the liver and spleen, nephrosis and anemia. In some of the glands were clumps of streptococci. This case on the basis of the gradual development of the reaction of the organism to the infection with streptococci and on the basis of a weak fermentative-oxidative function of the reticulo-endothelial system permits the hypothesis that lymphogranulomatosis is to be looked on as a form of long continued chronic sepsis.

EMERSON, Boston.

THE INVESTIGATION OF LOW BLOOD SUGAR CURVES. INGER JENSEN, Acta pædiat. **9**:405, 1930.

A boy, aged 8, suffering from steatorrhea caused by tuberculosis of the mesenteric lymph glands, showed an almost flat blood sugar curve in response to the oral ingestion of 1 Gm. of dextrose per kilogram of body weight. Capillary blood samples were taken every ten minutes for two and one-half hours. The study was then extended to a number of patients of about the same age suffering from a variety of complaints, not necessarily related primarily to a digestive disturbance. About half of the curves were low; that is, the maximum rise was less than 40 mg. per hundred cubic centimeters above the fasting level. The author concludes that low blood sugar curves with this dosage of dextrose are not uncommon.

MCINTOSH, Baltimore.

ACUTE MYELOGENOUS LEUKEMIA IN AN INFANT AGED FIVE MONTHS. LEIF SALOMONSEN, Acta pædiat. **9**:497, 1930.

A premature infant, weighing 2,500 Gm. at birth, had thrived well during the first three and one-half months of life. From then on, however, she failed progressively; ecchymoses and an increasing anemia developed. When admitted to the hospital at a little more than 5 months of age, she was extremely pale, with superficial hemorrhages, slight jaundice and moderate enlargement of both liver and spleen. The lymphoid structures were not enlarged. Examination of the blood revealed: hemoglobin 20 per cent, red cells 740,000 and white cells 37,260; a blood smear, though technically unsatisfactory, showed the presence of numerous myeloblasts, myelocytes and erythroblasts. The patient died the day after admission.

At autopsy, gray or pinkish nodules were found infiltrating the liver, kidneys, ovaries and the inner surface of the thoracic cage; histologically, these suggested a myeloid origin. There was also a diffuse myeloid infiltration of the bone-marrow, spleen, mesenteric lymph nodes and ovaries. The differential diagnosis from the lymphatic form of acute leukemia was established by the positive oxydase stain and the absence of typical changes in the lymphoid structures.

MCINTOSH, Baltimore.

Nervous Diseases

THE RELATION OF ENDOCRINOPATHIC STATES TO CONDUCT DISORDERS OF CHILDREN. LOUIS A. LURIE, Am. J. Psychiat. **9**:285 (Sept.) 1929.

In a series of children with behavior problems Lurie found that endocrinopathic states made up over 16 per cent of the endogenous factors. Disturbance of the function of ductless gland manifested itself not only by direct effect, as for instance the hyperactivity of the sufferer from exophthalmic goiter or the intellectual retardation of the cretin, but also by indirect influence, as the attitude taken by a patient toward society and himself when he was conscious of such abnormalities as sexual infantilism or statuesque gigantism. For this reason Lurie believes that a careful estimate of endocrine balance is an essential part of the examination of every child presenting a behavior problem. The paper concludes with the presentation of the cases of five children whose disciplinary difficulties were due to ductless gland disturbance, two of them presenting Frohlich's syndrome and one dwarfism, the other two being irregularities of sexual development. In discussing this subject, Osnato suggested that some of the disturbances were traceable to incidental factors, as for instance the internal hydrocephalus associated with pituitary tumors. Meyer warned against the danger of increasing the morbid outlook of these patients by emphasizing the endocrine abnormality.

DAVIDSON, Philadelphia.

A STUDY OF THE FUNCTIONAL PSYCHOSES IN CHILDHOOD. J. KASANIN and M. R. KAUFMAN, Am. J. Psychiat. **9**:307 (Sept.) 1929.

In the hope that the relatively less complicated personalities of childhood would permit of greater ease in the study of dynamic psychology, Kasanin and Kaufman conducted a survey of children under the age of 16 who were admitted to the Boston Psychopathic Hospital. Psychoses in childhood are rare, and of the 160 children admitted to that hospital in three years, only 65 had functional psychoses. Of this group schizophrenia, as diagnosed, constituted the major portion; after reclassification, however, it was thought that many of the cases of dementia praecox could be better placed elsewhere—as reactive, traumatic or toxic psychoses, some hysterical reactions, and a few undifferentiated conditions. The children suffering from dementia praecox showed alcoholism, insanity or delinquency in their heredity in almost every case. The problems of sexual adjustment seemed to play an important part in the mechanism of the psychoses, and sexual concern constituted a large part of the psychotic trend of the children. The precipitating factors were, in many cases, environmental difficulties of considerable seriousness.

DAVIDSON, Philadelphia.

BEHAVIOR DISORDERS IN CHRONIC EPIDEMIC ENCEPHALITIS. CHARLES E. GIBBS, Am. J. Psychiat. **9**:619 (Jan.) 1930.

After considering the symptomatic differences between the behavior of the constitutional psychopathic and the postencephalitic child, Gibbs concludes that the conduct disorder of the latter is the product of genuine organic cerebral pathology, probably thalamic. The functional association of the thalamus with the effective mechanisms and the emotional disturbance that would follow thalamic disease seem to be the responsible factors. A realization that the process is of an inflammatory nature suggests some degree of therapeutic optimism.

DAVIDSON, Philadelphia.

MYATONIA CONGENITA WITH PARTICULAR REFERENCE TO PATHOLOGY AND FAMILIAL TENDENCY. E. S. GURDJIAN, Arch. Neurol. & Psychiat. **24**:52 (July) 1930.

The author reports a case of myatonia congenita with detailed microscopic observations. The most important pathologic change was involvement of the

neuromuscular system. The changes were particularly marked in the lower part of the spinal cord and the lower extremities.

A family of six children is described in which three cases of myatonia congenita occurred.

BEVERLY, Chicago.

NIEMANN-PICK'S DISEASE: PATHOLOGIC STUDIES OF A CASE. GEORGE B. HASSIN, Arch. Neurol. & Psychiat. **24**:61 (July) 1930.

The author describes in detail the pathologic observations in a case of Niemann-Pick's disease and compares them with the observations in amaurotic family idiocy. While the fundamental type of changes in the brain are much the same, in Niemann-Pick's disease the pathologic phenomena are much more advanced. The most marked changes in both diseases are in the cerebellum and the thalamus. There is a far advanced parenchymatous lesion with transformation of the cerebellar cortex and optic thalamus into a glial scar in Niemann-Pick's disease; this process is less advanced in amaurotic family idiocy.

BEVERLY, Chicago.

TREATMENT OF THE RESPIRATORY PARALYSIS OF POLIOMYELITIS IN A RESPIRATORY CHAMBER. G. E. SHAMBAUGH, W. G. HARRISON, JR., and J. I. FARRELL, J. A. M. A. **94**:1371 (May 3) 1930.

The authors have treated three patients with respiratory paralysis in poliomyelitis in the Drinker respirator. One patient recovered, which is the first reported instance of recovery from poliomyelitis with respiratory paralysis severe enough to require artificial respiration.

BOSAR, Salt Lake City.

EPIDEMIC MENINGITIS CONTROL. GAYLORD W. ANDERSON and GEORGE H. BIGELOW, New England J. Med. **202**:518 (March 13) 1930.

The prevalence of epidemic cerebrospinal meningitis from 1920 to 1930 definitely increased, affecting all parts of the country. Greater numbers are found in late winter and early spring. No age is immune, but a larger percentage (60) of cases occurs in persons under 1 year. All infections are due to a meningococcus of variable types. For this reason, a change in serum may be beneficial. Carriers are more infectious than direct contact. All contact cases are potentially dangerous. Accurate diagnosis depends on clinical evidence plus lumbar puncture. If the fluid is turbid, serum should be given at once, and intensively for many days if laboratory evidence of meningococcic meningitis is found. Early diagnosis and treatment are most important. The Massachusetts Department of Public Health offers a diagnostic service for this type of disease.

GENGENBACH, Denver.

MENINGOCOCCUS MENINGITIS IN INFANTS. CHARLES F. MCKHANN, New England J. Med. **202**:520 (March 13) 1930.

The fatality rate increase from 25 per cent during the period from 1908 to 1911 to 43 per cent in the six years prior to 1929 is analyzed. Later diagnosis, the number of very young patients, the fulminating type of infection and the imperfect therapeutic procedures are given as causative factors. The bizarre clinical observations often account for the failure of early diagnosis in infants. Effective treatment consists of bringing the polyvalent serum in direct contact with the organism alternately by way of the lumbar subarachnoid space and ventricles. The dose should not exceed the amount of fluid removed, which seldom is more than 10 cc. A convincing table showing the degree of response to treatment based on the symptoms and duration of the disease is shown.

GENGENBACH, Denver.

AMPUTATION (LOWER LEG) SUBSEQUENT TO INFANTILE PARALYSIS. CHARLES F. PAINTER, New England J. Med. **202**:631 (March 27) 1930.

In postinfantile paralysis with incapacitation and loss of control of a lower extremity, poor circulation and chilblains, amputation affords a marked improvement in the patient's comfort and economic usefulness. A patient, aged 39, obtained a good result after amputation of the leg low enough to leave a good socket above. An amputation with favorable artificial leg function seems more satisfactory than a paralyzed or badly deformed extremity with painful chilblains.

GENGENBACH, Denver.

THE RÔLE OF THE VEGETATIVE NERVOUS SYSTEM IN EPILEPSY AND MIGRAINE. S. BROCK, New York State J. Med. **30**:442 (April 15) 1930.

Evidence of disturbed function of the vegetative nervous system is found in both epilepsy and migraine. Facts seem to point to involvement of the cerebral vascular mechanism as the essential mediate agency of the attacks. Whether the cerebral vascular bed is upset by indirect nervous or direct physicochemical influences is still an open question. The basic causative factors are still unknown.

AIKMAN, Rochester, N. Y.

TETANY AND KINDRED CONDITIONS. A. E. WADE, Northwest Med. **29**:160 (April) 1930.

Wade reviews the physiology of tetany and outlines the treatment with some of the more recently recognized measures.

SCOTT, Philadelphia.

CYST (INTRACRANIAL?). HUGH THURSFIELD, Proc. Roy. Soc. Med. **23**:828 (April) 1930.

An infant, aged 10 months, was admitted to the hospital in convulsions. After lumbar puncture the fits ceased. The cerebrospinal fluid was under pressure but was otherwise normal. An endeavor was made to obtain blood from the longitudinal sinus, but a yellow, slightly blood-stained fluid was obtained instead of blood. About 10 cc. of fluid was obtained which had a high protein content. A roentgenogram of the skull showed no abnormality. The child was unable to sit up, and seemed mentally subnormal.

WILLIAMSON, New Orleans.

PURULENT MENINGITIS DUE TO THE PFEIFFER BACILLUS IN INFANTS. T. MOGILNICKI, Rev. franç. de pediat. **5**:717 (Dec.) 1929.

The author points out that purulent meningitis is seen more often in infants than in older children or adults and that the Pfeiffer bacillus is not an infrequent cause. He reports nine cases due to this organism all of which were fatal. There is some evidence that the meningitis is part of a general septicemia. In his experiences, Jews were more frequently affected than infants of other races, and boys more often than girls. The cases developed during periods free from grippal epidemics.

LESLIE, Evanston, Ill.

TWO CASES OF VARICELLA WITH NEUROLOGIC COMPLICATIONS. V. BORRA, Riv. di clin. pediat. **28**:273 (April) 1930.

The author reviews the literature on neurologic complications of chickenpox. Two of his own cases are reported, one patient showing acute cerebellar ataxia and the other encephalitis and unilateral ophthalmoplegia (paresis of the left internal rectus muscle). Both patients recovered.

In analyzing neurologic complications of chicken-pox, the author discusses the relationship between the virus of herpes and the virus of varicella. However,

the complications may not have been due to the specific virus of varicella, but may have been caused by attenuated organisms of epidemic encephalitis or poliomyelitis, diseases which were endemic in the city.

HIGGINS, Boston.

VEGETATIVE DIATHESIS IN CHILDREN. E. ROMINGER, Arch. f. Kinderh. **89**:241 (Feb.) 1930.

Fifty children were studied who were classified as normal, vagotonic and sympathetic in nerve reaction. Studies of blood pressure were made after injections of epinephrine and atropine. With epinephrine the blood pressure in the normal group reached a height of 160 mm. eight minutes after injection and fell slowly to normal in twenty-five minutes. In the vagotonic type, there was a decrease in pressure in five minutes, then an increase in eight minutes and a return to normal in ten minutes. Both variations were within 10 mm. In the sympathetic type there was an abrupt rise of blood pressure to 220 mm. in five minutes and then an irregular fall to normal in thirty minutes. With both atropine and epinephrine all types were stimulated more regularly and for a longer period of time.

SANFORD, Chicago.

THE RELATION OF THE MUSCLE TONE OF THE GASTRO-INTESTINAL TRACT TO GASTRIC SECRETION. ANNA VON S. SZÁSZ, Monatschr. f. Kinderh. **47**:55 (May) 1930.

Three groups of patients were studied: (1) those with hypotonic musculature, (2) those with hypertonic musculature and (3) those with hypotonic musculature of the upper extremities and with normal tonus of the lower extremities.

In all cases of general muscular hypotonicity, the stomach and intestine showed atony and a diminution of gastric acidity.

In general muscular hypertonicity the gastro-intestinal tract showed good tone, lively peristalsis, hypersecretion and gastric hyperacidity. In the third clinical type the gastro-intestinal muscular tone, peristalsis and gastric secretion were normal. After hyperventilation the gastric acidity diminished in every case.

GERSTLEY, Chicago.

MUSCLE TONUS IN MENINGITIS. ANNA VON S. SZÁSZ, Monatschr. f. Kinderh. **47**:61 (May) 1930.

In children with meningeal symptoms a continual hypotonicity of the musculature of the extremities speaks for tuberculous meningitis and against purulent meningitis or encephalitis.

Hypertonicity of the extremities speaks against tuberculous meningitis (without brain tubercle) and for purulent meningitis or encephalitis.

GERSTLEY, Chicago.

PAROXYSMAL TACHYCARDIA AS A SYMPTOM OF ENCEPHALITIS IN BABIES. F. VON BERNUTH and R. VON DEN STEINEN, Ztschr. f. Kinderh. **48**:687, 1930.

An infant, aged 3 weeks, was admitted with a history of not taking its food well for three days, not sleeping well the night before, crying a great deal and twitching in the face. He was cyanotic and his heart showed a gallop rhythm but no enlargement. Under treatment with lobeline he became better; then there was a sudden onset of paroxysmal tachycardia. Lumbar puncture showed normal fluid. He became better and continued so for eight days, when cyanosis and spells of tachycardia reappeared, the pulse rate being from 180 to 200. The spells become longer and more frequent and did not respond to digipuratum. Thirteen days after admission he died. At autopsy the brain showed high grade edema and hyperemia, and hemorrhages into the brain substance. The diagnosis was diffuse encephalitis.

The second case occurred in an infant, aged 2 months, who had spasm of the right leg and apparent swelling fourteen days before admission. The temperature was 102 F. He had double otitis media. One day before admission he had twitching of the eye, he was pale and his throat and nose were inflamed. The heart was not enlarged. The abdomen was tense, and the neck stiff. There was mild rigidity of the right leg. For four weeks the temperature ran from 98.6 to 102 F. Lumbar puncture revealed globulin double plus and a few lymphocytes. Culture was negative for growth. On the fourth day after admission he vomited severely and the next day became suddenly cyanotic, his heart beating at the rate of 180. He improved under treatment with lobeline. Later he had repeated attacks of cyanosis and tachycardia with the pulse rate up to 200. No improvement was obtained with heart remedies. Then came fine clonic twitching and Cheynes-Stokes' breathing. He died on the twenty-ninth day. There was no autopsy, but it was thought, nevertheless, that he had encephalitis. There are only four cases of paroxysmal tachycardia reported in the literature, one of which occurred in an infant, aged 9 weeks, who had a septal defect and a transposition of the great vessels. The other patients were 3 weeks, 3 weeks and 8 months of age, respectively.

EMERSON, Boston.

PSEUDO-TETANUS (ESCHERICH). L. SZEGÖ, Ztschr. f. Kinderh. **48**:698, 1930.

Twenty-seven cases of pseudo-tetanus have been reported in the literature since Escherich first described it in 1896. The patient described by Szegö was 11 months of age. On his admission the child had risus sardonicus, marked opisthotonus, trismus and spasm of the muscles of the legs. The illness began six days before admission with an infection of the upper respiratory tract. He had been vaccinated five months before against smallpox. The spasm lasted through sleep. A lumbar puncture gave negative results. Though it was not thought that the child had tetanus, he was treated for it and on the eleventh day improved. He was discharged well on the thirty-third day. Nonappearance of the signs of tetanus, absence of a wound, spasm beginning in the lower legs and spontaneous cure can be relied on to differentiate pseudo-tetanus from true tetanus, and antitetanic serum should be used.

EMERSON, Boston.

AMINO ACID CONTENT OF THE CEREBROSPINAL FLUID IN HEALTHY AND SICK CHILDREN. S. LANG and I. LEVAY, Orvosi hetil. **74**:45 (Jan. 18) 1930.

The cerebrospinal fluid of healthy children and of children with congenital diseases of the central nervous system and with meningitis was examined. In fifty-one children, eighty-two examinations were made. Meningitis is the only pathologic condition in their series that showed differences from the observations in healthy children. In meningitis, together with other chemical changes described by other authors, the amino-acid content is increased. Normal values range between 0.9 and 1.42 mg. per hundred cubic centimeters. In meningitis, their observations range as high as 3.02 per cent.

ZENTAY, St. Louis.

Diseases of the Eye

IDIOPATHIC FAMILY HEMERALOPIA: NIGHT BLINDNESS IN CHORIOCAPILLARY DEGENERATION. A. BARBIERI, Arch. de oftal. de Buenos Aires **8**:669 (Nov.) 1929.

This paper is based on the observation of four children, all girls, several of whom had idiopathic hemeralopia. The eldest child had an enlarged thyroid, hypertrophied liver and muscular atrophy of the palms of the hands. The visual fields were greatly contracted; the photometric field measured from 20 to 30 degrees. The optic disks were normal. There were dark red and yellow striations in the choroid.

The second child was microcephalic, with a low mentality. The optic disks were small; the arteries were filiform, and there were plaques of choroid degeneration with fine yellowish and grayish punctiform granulations throughout the retina. The visual fields could not be determined. The photometric field measured 15 degrees. The third child presented similar subjective observations. The fundus was normal.

The author believes these to be cases of so-called retinitis pigmentosa without pigment. The condition is to be attributed to a lack or diminution of retinal purple elaborated in the pigmentary layer of the retina, brought about by vascular atrophy of the choriocapillaris and of the retinal arteries which degenerate from the periphery toward the center.

The etiologic factor is similar to a hepatic lesion or degeneration produced by chronic intoxications (syphilis, alcoholism, chlorosis). Because of this faulty regulation of the quantity of hematic pigment (bilirubin, hematoporphyrin, etc.), the excess of which in the blood may affect the photo-esthetic substances in the retina, these processes coincide with the degree of anemia and diminution of the hemoglobin.

Treatment should be directed toward the etiologic factor, if discoverable, and toward improving the condition of the blood and the hepatic function; specific medication consists in the use of iron, opotherapy, cod liver oil, iodine and anactinic protective glasses.

FINLAY, Havana, Cuba.

ON THE QUESTION OF FAMILIAL DETACHMENT OF THE RETINA. H. SCHMELZER, Arch. f. Augenh. **100-101**:268, 1929.

The author describes the cases of five sisters of one family with moderate myopia, in three of whom, between the ages of 18 and 25, there occurred a unilateral, flat detachment of the retina without tears. This occurred in the periphery of the eye with the presence of areas of chorioretinitis. Similar areas of chorioretinitis were found in the father and in one of the two remaining sisters without detachment.

The question of the causation of the detachment is discussed on the basis of inheritance and bodily structure.

ADLER, Philadelphia.

STATISTICAL REFLECTIONS ON TRACHOMA IN SCHOOL CHILDREN. PUSCARIU, Cluj. med., 1929, no. 9.

From 1916 to 1928, 391 students with trachoma, from 7 to 20 years of age, besides 100 other persons with trachoma, were treated; 258 of the first group suffered from trachoma of the first and second degrees, 21 from trachoma of the third degree and 12 also from pannus. In the second group, 12 had trachoma of the first, 37 of the second and 5 of the third degree, 46 had pannus and 9 had entropion. Hence, trachoma is more frequent in students, although pannus among them is rarer. In all instances infection occurred in the family. A determining factor in the origin of pannus is individual resistance.

BLATT, Siebenbuergen, Roumania.

EXAMINATION OF THE EYES, NOSE, LARYNX AND EARS IN 1,468 SCHOLARS. M. SUCIU-SIBIANU, Cluj. med., 1929, no. 9.

The author undertook his investigations in order to ascertain whether there is a certain relationship between refractive errors of the eyes and anomalies of the nasopharynx, larynx and ears. He was able to disclose ophthalmologic, otologic and rhinolaryngologic defects in 41 per cent; viz., myopia, 7.53 per cent; hypermetropia, 7.64 per cent; astigmatism, 0.66 per cent; strabismus, 0.44 per cent; various ocular defects, 2.32 per cent; trachoma, 1.66 per cent; adenoids, 13.19 per cent; hypertrophic rhinitis, 1.77 per cent; hypertrophic tonsils, 4.28 per cent, and otitis, 1.21 per cent. He found eye lesions altogether in 21.5 per cent, and otologic,

rhinologic and laryngologic lesions in 48.6 per cent. All the students afflicted with trachoma also showed otologic, rhinologic and laryngologic lesions. Consequently, trachoma arises on a lymphatic basis, associated with handicapped nasal respiration. The author did not, however, find any correlation between diseases of the nose and ears and refractive changes of the eye.

BLATT, Siebenbuergen, Roumania.

Diseases of the Ear, Nose and Throat

SOME EFFECTS IN LATER LIFE OF OTITIS MEDIA IN INFANCY. C. C. BUNCH and R. C. GROVE, Ann. Otol., Rhin. & Laryng. **39**:1 (March) 1930.

A detailed study was made of a series of eighty cases in an effort to determine the effects of otitis media in infancy on the acuity of hearing in later life. The plan was to secure accurate information regarding any impairment of hearing that might be present from seven to fifteen years after the occurrence of a definite suppurative otitis media observed and treated during hospitalization on a pediatric service. Roentgenograms were made of the mastoids in order to determine the effect of this infection of the middle ear on pneumatization. Only those cases in which three or more myringotomies had been performed were included in the series. At the time of examination, the ages of the children selected ranged from 7 to 16 years. At the time of admission to the hospital when the otitis media was present, their ages ranged from 2 days to 4 years and 8 months, forty-seven being under 1 year of age.

Thirty ears, or 19 per cent, had appreciable loss of hearing when examined. Ten of these thirty ears were discharging. Dry perforations were present in five. In twelve ears the tympanic membranes were normal. The otoscopic examination, except in cases in which discharge was present, gave the examiner little idea as to the relative hearing power. Roentgenograms revealed normal development in thirty-one mastoids, while sixty-seven were reported sclerosed or with some other form of arrested pneumatization. The authors conclude that factors other than otorrhea alone must play an important part in the loss of acuity in hearing and in the pneumatization of the mastoid.

SNAPP, Grand Rapids, Mich.

IS STUTTERING A MEDICAL PROBLEM? J. A. GLASSBURG, Arch. Otolaryng. **11**:430 (April) 1930.

Speech difficulties should be looked on as a medical subject and the cure supervised by physicians. The lack of instruction on speech disorders in medical colleges is to be deplored. Disorders of speech may be classified as (1) stuttering and stammering and (2) defective phonation. The author considers stammering and stuttering as synonymous. Heredity is an important factor. These patients are hypersensitive and often have personality defects. Predisposing causes are found in the fact that they are introspective, shy, secretive, overanxious and absent-minded and have inferiority complexes. The exciting causes are mental shock and psychic trauma.

Psychoanalysts think of stuttering as the outward expression of an internal conflict. Stuttering may be defined as a spastic coordination neurosis based on a mental conflict. The patient should have a thorough physical, mental, vocal and phonetic examination with a careful history. This must be for at least three generations and include the developmental period, previous illnesses, injuries, operations, habits, progress at school and the home and social environment. Physical causes must be eliminated. A chart for phonetic examination is submitted. In treatment, the first point is to neutralize the emotional obstacle. The patient must understand that the treatment will take a long time. Psychoanalysts may be employed to discover the conflict. Suggestions may give self-confidence; distraction may help; muscles must be relaxed; an effort must be made to make the stutterer less self-conscious by exercising systemic relaxation; proper control

of breathing and efforts to exercise the tongue, lips and soft palate will all prove beneficial. As there is no primary disorder in stuttering, efforts to cure with phonetic instruction alone are harmful. However, bad habits of speech may be formed and these require reeducation along phonetic lines.

HUNTER, Philadelphia.

RADIATION THERAPY OF TONSILS. LEILA CHARLTON KNOX, J. A. M. A. **94**:705 (March 8) 1930.

The author concludes that roentgen irradiation of the tonsils should not replace tonsillectomy in the rheumatic child except in patients who, because of some complication or because of the severity of their cardiac condition, are poor operative risks. This treatment should not be used in acute follicular tonsillitis, sepsis, mononucleosis, syphilis, diphtheria, scarlet fever or abscess of any type and it is contraindicated in acute sinusitis. It is a useful and important agent in the treatment for recurrent tonsils and adenoids, hypertrophic pharyngitis and bronchitis. No injury to the endocrine glands in these children has been demonstrated.

BONAR, Salt Lake City.

TRACHEOBRONCHIAL ADENITIS. C. P. EMERSON, New York State J. Med. **30**:651 (June 1) 1930.

Shadows about the hilus are of questionable diagnostic value except in children. It is possible to diagnose unsuspected nasal sinusitis from the appearance of these hilar shadows. The infections probably reach the tracheobronchial nodes by repeated descending infections of the mucous membrane during recurring colds or "grip." Sinusitis has shown a great increase since the epidemic of influenza.

Many of the nodes are embedded in the lung tissue of the hilus. Such nodes may be the starting points of central pneumonia or interstitial pneumonia. Many cases of recurrent bronchitis with dry cough lasting for months are due to infected nodes. Moderate roentgen therapy is advised. Infected sinuses demand active treatment.

AIRMAN, Rochester, N. Y.

CASE OF SUBMUCOUS CLEFT PALATE. W. KLESTADT, Ztschr. f. Laryng., Rhin. **19**:279 (May) 1930.

Klestadt points out that the authorities hold different opinions regarding the frequency of submucous cleft palate. Some consider it extremely rare, whereas others have observed it more often. The author noted this anomaly only twice among 500 patients with defective speech. Recently, he observed submucous cleft palate in a girl, aged 6. This case is noteworthy because the relative insufficiency of the nasopharyngeal closure was not caused by the shortness of the velum palatinum, but rather by the static and dynamic abnormality of the same. Only the hard palate, in the median line and in its bony portion, was too short; the marginal portions of the obturator of the palate reached posteriorly so as to correspond to the alveolar process. During the development, it did not come to the medial closure or to the transversal growing through of the musculature within the soft palate; the soft palate had lost its transverse and tense attachment because a median, symmetrical, triangular, bony structure in the obturator of the palate was missing. Like the gap in the musculature of the soft palate, this structure was also covered by the mucous membrane. This abnormality was probably present because the obturator of the palate in the posterior direction and the velum palatinum in the anterior direction did not develop completely, as the highest differentiated mesenchymal tissues, such as bone and muscles, were deficient. Besides this bony and muscular deficiency, the child had a divided uvula. A congenital malformation of the nose also existed, in which the nares were divided by a groove; the left ear had the cercopithecus form, and a formerly existing fovcola coccygea had disappeared almost entirely. Besides the tissue defects, there

were excessive tissues in the form of a nevus flammeus on the under arm and a fibroma molluscum on each mammilla. All of these malformations indicate internal causes. The author thinks that in such cases spontaneous further development post partum is possible, as it has been observed in cases with a divided uvula. This factor should not be overlooked in the therapy, especially when surgical intervention is intended.

[ARCH. OTOLARYNG.]

PYEMIA FOLLOWING TONSILLECTOMY: PROPHYLAXIS AND TREATMENT. M. GOERKE, Ztschr. f. Laryng., Rhin. **19**:287 (May) 1930.

Goerke directs attention to the fact that a tonsillectomy that is performed to prevent pyemia occasionally may lead to it. He reports a case from his own observation. In a girl, aged 20, who had frequent attacks of tonsillitis, tonsillectomy was done ten days after an attack, and pyemia developed. The author thinks that this complication set in because the interval between the tonsillitis and the tonsillectomy was too short. He emphasizes that it is advisable that from four to six weeks should elapse after a tonsillar infection before tonsillectomy is done. This precaution had been disregarded in this instance because the patient did not wish to lose too much time. In order to insure against infection that may be spread by the needle that is employed for the administration of the local anesthetic, the author advises that several should be kept in preparation, and if one should penetrate into the tonsillar tissues it should be exchanged for a sterile one. As another prophylactic measure, he emphasizes that all carious teeth should be removed or treated before the operation is begun. In order to detect possible latent infections, the temperature should be measured during the last days preceding the tonsillectomy. During the operation itself, the sterilization of hands and instruments is not sufficient. All unnecessary tearing of the tissues should be avoided. Frequent dabbing may also have harmful effects. It will not be necessary when, after the separation of the upper pole, a tampon is placed into the upper tonsillar niche. This tampon should remain until the operation is completed. Tamponade after completion of the surgical intervention is, according to the author's experience, of no significance for the prevention of postoperative infection. However, he advises that the wound be covered with an antiseptic iodine powder which also has a hemostatic effect. In regard to the treatment for tonsillogenic pyemia, which may have been caused either by tonsillitis or by tonsillectomy, the author stresses the following precautions: Early intervention is necessary. If attacks of chills recur and if other causes may be excluded, treatment should be instituted at once. Cervical mediastinotomy, with exposure of the jugular vein, ligation of the vena fascialis communis and drainage of the spatium parapharygneum, is recommended. If the facial vein is thrombosed, either excision should be done or the jugular vein should be ligated above and below the place of anastomosis of the vena fascialis communis. If the venous thrombosis is extensive, the thrombosed vessels should be removed following the ligation of the jugular vein. If the jugular vein itself is diseased, ligation should be done as deeply as possible, the vein should be slit or excised, and ligation should also be done at the base of the skull. If the jugular vein is not involved, it should be let alone.

[ARCH. OTOLARYNG.]

Diseases of the Skin

THE USE OF BACTERIOPHAGE FILTRATES IN THE TREATMENT OF SUPPURATIVE CONDITIONS: REPORT OF 300 CASES. T. B. RICE, Am. J. M. Sc. **179**:345 (March) 1930.

Excellent results are reported in nearly all cases of boils, carbuncles, abscesses and cellulitis. A few cases did not respond well and a few were failures. In all open cases the filtrate was applied as a wet dressing; some of the patients with furuncles received injections as did those with cellulitis.

Patients with infected wounds, ulcers of the legs, bed sores, osteomyelitis and sinusitis were all treated with good results in most instances. Patients with impetigo responded well, as did those in which there was a good deal of suppuration. In the last-mentioned group the filtrate was applied in a 1 per cent agar jelly.

In general, the treatment yielded excellent results in 90 per cent of the cases, stock preparations being apparently as good as autogenous ones.

JAMIESON, Detroit.

THE TREATMENT OF CAVERNOUS ANGIOMAS COVERED WITH HEALTHY SKIN. WILLIAM H. SCHMIDT, Am. J. Roentgenol. **19**:271 (March) 1928.

Angiomas are grouped as (1) port wine mark or nevus flammeus, (2) nevus vasculosus or strawberry mark and (3) nevus cavernosus or cavernous angioma, some of which are covered with healthy skin while others present a small area showing discoloration and enlarged elevated vessels. In the cases studied, 5 or 10 mg. radium needles were inserted through the healthy skin into the depths of the angioma. The angioma began to shrink within a week and usually disappeared completely in from four to six weeks. The end-result showed no effect on the skin.

STULIK, Chicago.

TWO CASES OF ACRODYNIA. R. GURALNICK, New England J. Med. **202**:476 (March 6) 1930.

Two cases of acrodynia are presented with the probable etiology of infection, the most prominent symptoms being irritability, loss of weight, photophobia and an indefinite rash. The conception that vitamin B deficiency is the causative factor in acrodynia is discounted. There is a greater prevalence of the disease than is ordinarily conceded.

GENGENBACH, Denver.

A CASE OF ERYTHROEDEMA. W. A. ALEXANDER, Edinburgh M. J. (Tr. Med.-Chir. Soc.) **37**:37 (April) 1930.

A girl, aged 6½ months, full term, entirely breast fed, had made uninterrupted progress until the age of 4 months. Thereafter, without apparent cause, the disposition changed to irritability, the sleep became restless, and photophobia appeared to the extent that the child would bury her face in the pillow. The appetite became less and the muscles soft; the ability to hold up the head was lost; the mouth was always open and drooling. Ulcers were present in the mouth; there were excessive sweating, miliaria and itching, and finally swelling, redness and desquamation of the hands and feet appeared, about six weeks after the sweating began. The child cut three teeth between the ages of 5 and 6 months. Alexander thinks that erythredema is not common in Scotland, though mild degrees may be unrecognized. He regards the etiology as extremely obscure.

NEFF, Kansas City, Mo.

CREEPING ERUPTION IN NATAL. F. G. CAWSTON, J. Trop. Med. **33**:56 (Feb. 15) 1930.

A study of the creeping eruption in Natal led to the conclusion that it was due to a parasite of domestic pets, the most likely being *Ankylostoma braziliense*. Children were found to be readily infected and were also found to be infected with intestinal worms. Inoculation by the larvae may occur through the unbroken skin, some deevloping into adult intestinal worms, and others remaining in the skin and producing the local eruption. Other bacilli may adhere to the larvae, which may help to explain the occurrence of furuncles and local dermatitis following exposure.

JAMIESON, Detroit.

ERYTHRODEDEMA POLYNEURITICUM. R. E. SMITH, Proc. Roy. Soc. Med. **23**: 269 (Jan.) 1930.

A girl, aged 3, was admitted to the hospital suffering from diarrhea. At this time a diffuse erythematous rash was noticed on the limbs. She had anesthesia over the limbs and smelled strongly of mice. Since then she had had several similar attacks. In December, 1928, she was again admitted to the hospital with a similar attack. Mentally she was very backward. There was no edema present but the same erythematous rash. At this time the case was diagnosed "erythroedema polyneuriticum." No subsequent attack occurred.

WILLIAMSON, New Orleans.

THE EDEMA OF INFANCY. JEAN CATHALA, Nourrisson **18**:82 (March) 1930.

"Physiology and clinical observation both show that water plays an important rôle in the nutrition of infants." The water content of a six weeks embryo is 97.5 per cent; for the new-born it is 69 per cent and for the adult 63 to 58 per cent. With such a high water content, the physiopathology of water metabolism must be of prime importance and hence the frequency of various types of edema during infancy.

Aside from the edemas caused by congenital anomalies of the heart, portal circulation or the urogenital tract the author calls attention first to the frequency of syphilitic edemas. These are usually due to syphilitic involvement of the liver or kidneys. When syphilis can be ruled out, congenital debility and prematurity can often be invoked in those infants who have not been adequately protected from the cold. These cases may depend on a true nephritis. Other cases are placed in the so-called idiopathic groups. These are usually associated with either (1) disturbances in nutrition; (2) constitutional states, such as certain eczemas, erythroderma desquamativa, tetany and anemias (Ribadeau-Dumas has shown hypoproteinemia and increased water content of the serum in certain cases of eczema); (3) alimentary edema, the four common types being excessive salt intake, too much carbohydrate, disturbance in the protein and fat ratios and deficiency diseases, especially a lack of vitamins A and B, and (4) infections.

This classification is admittedly artificial, and pure examples are rarely encountered.

MCCLELLAND, Cleveland.

THE DIAGNOSTIC VALUE OF ERYTHEMA NODOSUM. A. WALLGREN, Rev. franç. de pediat. **5**:739 (Dec.) 1929.

This study was made at the Children's Hospital of Göteborg, Sweden. In the last five years, 213 of the 872 children admitted to the hospital for different tubercular diseases have had erythema nodosum. The author believes that this manifestation is equivalent to a positive tuberculin reaction, and that it first appears at the time when the preallergic period of incubation gives place to the first clinical period, or in other words at the time when the sensitivity to tuberculin develops. It also may appear when there is an exacerbation of the tuberculous process.

LESLIE, Evanston, Ill.

HERPES ZOSTER AND VARICELLA. M. OLINTO, Arch. de pediat. **2**:557 (March) 1930.

The author believes that von Bokay's observations on the similarity of herpes zoster and varicella is the correct interpretation. In the cases reported, the transmission of varicella to herpes zoster and vice versa, with an identical period of incubation, gives the impression of a common filtrable virus.

SANFORD, Chicago.

CONTRIBUTIONS TO A CLINICAL STUDY OF NEUROGENIC ECZEMA IN CHILDHOOD. M. BODDIN, Med. Klin. **26**:270 (Feb. 21) 1930.

Up to the present time, there has been no sharp line between exudative diathesis and neurogenic eczema. A lability of the nervous system is present in exudative diathesis. The name neurogenic eczema points to a close connection between this condition and the nervous system. Neurogenic eczema often can be traced back to early infancy. It would be valuable if it were possible to differentiate clinically between the manifestations of exudative diathesis and neurogenic eczema. The author finds the following points of difference. Exudative diathesis prefers the face, neck and scalp. Neurogenic eczema is more often localized on the extremities and particularly over the elbow and in the fold of the knees. The distribution is symmetrical as a rule. Neurogenic eczema causes troublesome itching. Exudative diathesis occurs usually in pasty looking children while neurogenic eczema is present in thin children. There seems to be a special predisposition of the skin to neurogenic eczema.

Thirty-three cases of eczema were followed up until adult life; twenty-four of these started under 2 years of age, and in nineteen of them neurogenic eczema was still present at the age of 18 to 20 years; fourteen of the thirty-three patients showed a healing between the ages of 2 and 11 years; five children had asthmatic attacks since early childhood. The more resistant cases of neurogenic eczema seemed to be those that had a beginning as early as from 3 to 5 months of age. The nervous system of these children and also that of the parents showed a marked lability. Several of the children had night terrors and presented other emotional disorders. On the other hand, in the cases in which there was a prompt and early healing the nervous system seemed to be only slightly involved or it was possible to influence it favorably through proper educational methods. In the treatment for neurogenic eczema, local treatment of the skin is not sufficient. The nervous system needs special attention. Many instances could be cited in which nervous excitement produced new attacks of eruption. The patient can be treated for the nervous condition through either reeducation or a change of environment, depending on the problem presented in the case. For local treatment, different tar preparations are recommended.

ZENTAY, St. Louis.

DETERMINATIONS OF THE BLOOD ACIDITY, ESPECIALLY IN CHILDREN WITH ECZEMA. K. SCHEER, Ztschr. f. Kinderh. **48**:668, 1930.

Determinations of blood acidity by measurement of the p_H of the blood by means of the quinhydrone electrode and determination of the alkali reserve gave the following conclusions. The blood of the adult is more alkaline than that of the child and still more than that of infants. The blood acidity in infants is pushed to the alkaline side in fever and by the feeding of irradiated milk. The blood acidity can be pushed toward the acid side by the administration of acids, for example, hydrochloric acid or tartaric acid. In eczema in infants there was found regularly a definite increase in the alkalinity of the blood. This stands well in causative association with the outbreak of skin manifestations and explains the prompt effectiveness of acid salt therapy in this condition.

EMERSON, Boston.

Surgery and Orthopedics

OSTEOCHONDRITIS DISSECANS. G. E. RICHARDS, Am. J. Roentgenol. **19**:278 (March) 1928.

Osteochondritis dissecans is a joint lesion in which localized, punched-out areas of destruction occur with the separation of a hard fibrous sequestrum. In the knee it is always at the outer side of the inner condyle opposite the tibial tubercle and the latter is usually long. In other joints, such as the hip, elbow

and bones of the foot, the lesion has been found only in the exposed positions and following trauma. The lesion is sharply defined or punched out with well outlined borders and no roentgen evidence of inflammatory or infective origin. The joint proper is not involved and surgical removal of the involved bone results in a radical cure.

STULIK, Chicago.

AN UNUSUAL ROENTGENOGRAPHIC FINDING IN THE HIP. PHILIP LEWIN, Am. J. Roentgenol. **19**:290 (March) 1928.

A girl, aged 9, showed coxa vara with a shadow at the lower margin of the capital epiphysis presenting the appearance of an adventitious bone of semilunar outline. This may be a lesser trochanter, a split-off portion of the capital epiphysis or a separate ossification center. Medical gymnastics with forcible abduction of the legs improved the gait, which was interfered with by the marked limitation of abduction. The patient was treated with thyroid for the associated cretinism.

STULIK, Chicago.

FEET: GOOD, BAD AND INDIFFERENT. J. E. M. THOMSON, Nebraska M. J. **15**:267 (July) 1930.

The time to treat deformities of the feet is before they occur. At the earliest period in life, attention to the foot is important. Stockings that are too short or too small are often used on baby feet. The infant's stocking should come at least 1 inch (2.5 cm.) beyond the end of the toes and should not be tight in circumference. The shoe should be a full half inch longer than the child's foot, should be made of pliable leather, and laced well above the ankle joint. The sole should be heavy and strong enough to maintain the shape of the shoe. Both sole and heel should be wide. For the older child it is well to have two pairs of well fitting shoes, so that changes can be made frequently to allow both leather and lining to dry.

The author reports that in a survey of 1,235 school children in Minnesota, only 140 showed normal feet; 515 had weak arches and 708 ingrowing toe-nails, and 496 were wearing ill-fitting shoes. It is during the growing period that most of the deformities of the feet develop.

HAMILTON, Omaha.

BILATERAL KÖHLER'S DISEASE. CECIL P. G. WAKELEY, Proc. Roy. Soc. Med. **23**:826 (April) 1930.

A case of bilateral Köhler's disease in a child, aged 6 years, is reported.

WILLIAMSON, New Orleans.

RESULT OF OSSEOUS ABUTMENT FOR CONGENITAL LUXATION OF HIP. RAPHAËL MASSART, Bull. et mém. Soc. de chir de Paris **22**:173 (March 7) 1930.

The writer describes roentgengraphic observations in a girl, aged 16 years, operated on four years before, a graft being taken from the wing of the ilium. The graft had increased considerably in size and formed a powerful abutment well suited to the purpose.

BIEKER, St. Petersburg, Fla.

CHRONIC VOLVULUS OF THE PELVIC COLON. A. CROISIER, Bull. et mém. Soc. de chir. de Paris **22**:213 (March 7) 1930.

A girl, aged 11 years, with signs suggesting tuberculous peritonitis was operated on; the pelvic colon was found to be twisted on itself into a figure eight, with considerable diminution in caliber at the loop. Detorsion of the fold was followed by uneventful recovery.

BIEKER, St. Petersburg, Fla.

APPENDECTOMY AND INVAGINATION IN INTUSSUSCEPTION. J. GANDULFO, Rev. chilena de pediat. **1**:66 (Feb.) 1930.

Gandulfo reports a case of intussusception of the ileocecal junction in a child aged 5 years. After reducing the condition, he used Pérer's method of invagination of the appendix. The postoperative course was uneventful.

SANFORD, Chicago.

ROENTGEN DIAGNOSIS OF ILEUS IN CHILDHOOD. G. WEBER, Monatschr. f. Kinderh. **47**:11 (May) 1930.

The main cause of ileus in childhood is intussusception. Weber calls attention to an article by Schwarz written in 1911. The latter noted that intussusception can be diagnosed by roentgenograms without a contrast meal. If the roentgen rays are placed parallel to the surface of the fluids accumulating in the loops of intestine above the obstruction, the picture will show a great collection of gas bubbles with many mirror-like reflections.

The great advantage of this procedure is the speed of diagnosis. Weber reports several cases and shows pictures illustrating his points.

GERSTLEY, Chicago.

Miscellaneous

THE PREVENTION OF GONORRHEAL VAGINITIS IN BABIES' HOMES AND HOSPITALS. JESSIE MARSHALL, J. Social Hyg. **16**:359 (June) 1930.

Precautionary measures to enable institutions caring for babies to discover and prevent the spread of gonorrheal vaginitis are mentioned. These include (1) adequate instruction of nurses and attendants concerning the etiology, transmission, prevention and treatment; (2) careful examination of applicants for admission including (*a*) physical examination and (*b*) smear examination (preferably two or three smear examinations at intervals of several days); (3) adequate facilities for observation and isolation of the suspicious case; (4) daily inspection of the vulva by the nurse bathing the baby; (5) single service diaper or sterilization of diapers; (6) daily disinfection of bathtubs and utensils required for general use; (7) individual thermometer, wash-tub, soap, towels and basin; (8) shower bathing rather than tub bathing for older children; (9) U-shaped toilet seat of proper height, and (10) no sharing of beds.

Exposed healthy contacts from a room in which there are cases of the disease may be considered safe for discharge from the institution when smears on four occasions over a period of perhaps six weeks have been found negative. The author recommends as a final precautionary diagnostic test the instillation locally of a provocative dose of rabbit's serum before the making of the final smear.

A child eligible for placement or adoption cannot be considered cured until (1) she is free from discharge, (2) cervical examination, both visual and with the aid of the urethroscope, yields negative results and (3) from eight to ten vaginal smears over a period of weeks are found negative.

Measures for the isolation and conduct of infected cases are outlined. The author does not discuss treatment other than prevention.

GRAVES, New York.

EPHEDRINE AND RELATED SUBSTANCES. K. K. CHEN and CARL F. SCHMIDT, Medicine **9**:1 (Feb.) 1930.

1. Ephedrine is the chief active principle occurring in the Asiatic species of Ephedra. The other constituents that are present in the Chinese species are pseudo-ephedrine, nor-d-pseudo-ephedrine, l-methylephedrine, and d-methylpseudo-ephedrine.

2. Ephedrine is a stable compound. Its solutions are not decomposed on exposure to air, light or heat, or by long standing.

3. Ephedrine has been successfully synthesized by various methods.

4. In mammals, ephedrine in suitable doses raises the blood pressure, increases cardiac activity, dilates the pupil, relieves bronchospasm, contracts the uterus and more frequently inhibits than stimulates the gastro-intestinal tract. These effects can be explained by the stimulation of the myoneural junctions of the sympathetic fibers. In certain instances, there is an additional stimulation of the ganglions. It has been claimed by some investigators that it acts on the smooth muscles.

5. In animals, ephedrine does not have a marked effect on any of the body secretions.

6. There is an increase in the formed elements of the blood and hyperglycemia, following the administration of a suitable quantity of ephedrine.

7. Ephedrine increases slightly the basal metabolic rate and the oxygen consumption.

8. Ephedrine may stimulate the central nervous system.

9. Ephedrine is easily absorbed and has a low toxicity.

10. In clinical use, ephedrine can be applied locally and be given by mouth or by injection. Persons who do not have a vagosympathetic equilibrium may experience untoward symptoms.

11. Ephedrine has been used with success in the treatment for bronchial asthma, hay fever, whooping cough, bronchitis, postural hypotension and Adams-Stokes' syndrome, in combating the fall of blood pressure in spinal anesthesia, in antagonizing the action of narcotic drugs, in shrinking the congested nasal mucous membrane and in dilating the pupil for ophthalmic examination. Its value in dermatology, shock and dysmenorrhea is promising.

12. Compared with epinephrine, ephedrine has a less intense but more prolonged action.

13. Of the many synthetic compounds, di-ephedrine, and di-nor-ephedrine deserve more extensive clinical trials.

AUTHORS' SUMMARY.

MARINE CLIMATOTHERAPY IN DISEASES OF CHILDHOOD. GEORGES BARRAUD, Arch. de méd. d. enf. **33**:284 (May) 1930.

Barraud reviews the advantages of sea air in certain debilities incident to early life and discusses at considerable length the special attractions of that portion of the French Atlantic littoral in the department of Charente-Inférieure. Here the moderate temperatures, the inviting sea beaches, the moderate rain fall, tempered winds and particularly the preponderance of sunny days combine to provide an ideal climate the year round for children suffering from surgical tuberculosis, rickets, anemia and the various dystrophies associated with defective development.

AMESSE, Denver.

CHEMICAL INQUIRY INTO THE FETAL MORTALITY IN RIO DE JANEIRO. C. C. DA COSTA, Arch. de hyg. **4**:123 (Jan.) 1930.

The causes were found to be: obstetric, 53.5 per cent; syphilis, 26 per cent, and other causes, 20.5 per cent. To bring down this mortality, sanitary education in primary schools, propaganda against venereal diseases, prenuptial examination and wider supervision during the prenuptial period are recommended.

SANFORD, Chicago.

INSTITUTE OF PEDIATRICS AND CHILD CARE OF THE SCHOOL OF MEDICINE, MONTEVIDEO. VICTOR ESCARDÓ Y ANAYA, Bol. Inst. internac. am. de protec. a la inf. **3**:627 (April) 1930.

In order to enlarge its staff and build the necessary houses, the Children's Clinic, of which Dr. Louis Morquio is in charge, has been lately organized as an institute. It will remain under the direction of the professor of pediatrics and will be divided into four sections. The first will include: a department for the

assistance and lodging of the infants and mothers and of older children (boys and girls); two rooms for surgery and orthopedics; infants' and general clinics, and clinics for infectious disease. The second section will be for clinical technic with laboratories for chemical, bacteriologic, and anatomopathologic analyses, a division for autopsy and a service of roentgenology and electrotherapy. In the third section, devoted to child care, there will be an amphitheater in which lectures will be given to mothers, nurses and teachers. The fourth section is devoted to the preparation of the children's foods and to the teaching of dietetics.

AUTHOR'S SUMMARY.

SCHOOL NONATTENDANCE AND JUVENILE DELINQUENCY. LADISLAO THOT, Bol. Inst. internac. am. de protec. a la inf. 3:681 (April) 1930.

Pedagogues and sociologic criminologists are well aware of the existing relation between school nonattendance and juvenile delinquency, a relation which may be estimated as that of cause and effect. The child who attends schools regularly does not rove, increases his learning and so avoids delinquency.

The causes of nonattendance may be the following: the parent's dislike of school and teachers; the child's engagement in work at home or in industrial or rural labor; sickness of parents; lack of money to buy food, clothes and books; the child's fear of the teacher; the lack of will on the part of the child to attend school; bad companions, etc.

The means to avoid nonattendance at school may be either preventive or restrictive. Among the first, one may consider the auxiliary organizations, such as children's aid societies, the school doctor, the social visitor, the attendance officer, whose functions are well regulated in the United States, and the special schools for chronic truants which give the children education and manual training when they are old enough. Among the restrictive measures, the application of fines to the parents, and in some cases to the child as well, may be used in addition to the special schools.

LESLIE, Evanston, Ill.

A RESEARCH ON INFANT MORTALITY. FRANCISCO FIGUEIRA DE MELLO, Bol. Inst. internac. am. de protec. a la inf. 3:691 (April) 1930.

The author states that using the file card of the Society of Nations and aided by the Sanitary Visitors, he carried out an investigation on infant mortality among children under 1 year of age in the District of Bom Retiro.

Utilizing the information furnished by the civil authorities on 1,162 children, he identified all those born within the district after February, 1928, and recorded 904 of them, with the following results: In 1928, the rate of infant mortality was 120 per 1,000 births. In Sao Paulo City, Brazil, it was 160. Among the causes of death, the following are mentioned: digestive disturbances, 14.81 per cent; pneumonia, 11.11 per cent, and next, congenital weakness. The age of the dead infants was as follows: from 1 to 2 months, 18.51 per cent; from 2 to 3 months, 11.11 per cent; from 3 to 4 months, 7.40 per cent, and from 5 to 6 months, the usual time of weaning, it rose again to 11.11 per cent. The feeding of the children under 6 months who lived until they were 1 year of age was: mixed feeding, 42.22 per cent; breast feeding, 35 per cent, and artificial feeding, 22.79 per cent. The assistance received at confinement by the mothers of children who reached their first birthday, was: from licensed midwives, 67.77 per cent; from nonlicensed midwives, 31.65 per cent, and from physicians, 0.55 per cent. Syphilis was the chief factor of stillbirth, the rate being 26.31 per cent.

LESLIE, Evanston, Ill.

OPEN-AIR SCHOOLS IN MONTEVIDEO. AMERICO MOLA, Bol. Inst. Internac. am. de protec. a la inf. 3:707 (April) 1930.

There are three open air schools in Montevideo. During 1929, 1,516 pupils (773 boys and 743 girls) attended these schools. On entering, 80 per cent of these

children had a lower weight than normal, and 67.74 per cent a lower height; 76.71 per cent were deficient in their chest measurements.

In order to admit all the weak children of the city schools, their regular stay in the open air school has been limited to four months. The author estimates that this period is insufficient and that it would be necessary to create other similar institutions so as to permit a regular stay of six months for every child; one of the periods would extend from February to July, and the other from August to January.

The need of special visiting nurses and of dental clinics for each of these schools is expressed. Among 1,516 pupils, 1,228 were found to suffer from tooth decay.

The families of 64.64 per cent of these pupils are destitute, and 27.96 per cent half destitute; this explains how 49.27 per cent of them live in lodging houses (casas de inquilinato) and 35.34 per cent in poor apartments. The number of children who live in an only room with the other members of the family, numbering eight, nine or even more persons, reaches a rate of 45.97 per cent. Of the total number, 9.23 per cent are children of tuberculous parents, which means a contagion peril since the open air schools are only day schools.

The children who were found normal on entering, were thus distributed: normal weight, 20 per cent; normal height, 32.25, and normal chest measurements, 23.28 per cent. On leaving, they showed the following increase: in weight, 87.6 per cent; in height, 79.28 per cent, and in chest measurements, 73.35 per cent. These figures show the favorable results of the schools mentioned, which can hardly be surpassed.

LESLIE, Evanston, Ill.

INFANT MORTALITY IN THE AMERICAS. A. A. MOLL, Bol. ofic. san. panam. **9**:654 (June) 1930.

Country	Births per 1,000 of Population	Deaths per 1,000 Births
Argentina	29.8	106.6
Bermudas	24.3	102.8
Bolivia (La Paz)	34.6	297.2
Brazil (Rio de Janeiro)	21.4	156.6
Canada	24.5	89.6
Columbia	24.5	144.3
Chile	47.9	188.0
Ecuador	38.8	140.4
Guatemala	50.7	81.8
Mexico	34.6	193.0
Nicaragua (Managua)	49.4	.....
Paragua (Asuncion)	41.6	108.9
Peru (Lima)	39.2	155.3
United States	19.7	68.0
Uruguay	25.0	100.0
Venezuela	31.3	144.0

SANFORD, Chicago.

THE MENTAL LEVEL OF BABIES IN THE JUVENILE COURT OF BARCELONA. CLAUDIO BASSOLS, But. de la Soc. Catalana de pediat. **1**:5 (April) 1928.

Bassols describes the application of intelligence tests in the Juvenile Court of Barcelona. He finds the tests of Therman very complete, but those of Binet-Simon more practical for use in the court. The results of the money-changing tests were inaccurate, owing to the early knowledge of money which the beggers, working-children and waifs acquire. He emphasized the fact that the tests merely give the approximate mental age and are not a sufficient basis for psychologic diagnoses.

WATSON, Chicago.

THE PROGRESS OF PROPHYLAXIS IN DISEASE. R. KRAUS, Rev. chilena de pediat. **1**:57 (Feb.) 1930.

The author reviews the conditions in which vaccines are specific, and discusses the newer forms of nonspecific medication, such as transfusion, protein therapy and malarial treatment for tabes.

SANFORD, Chicago.

CHILD WELFARE: II. INSTITUTIONS FOR BACKWARD CHILDREN. ARTHUR KELLER, Monatschr. f. Kinderh. **47**:1 (May) 1930.

Keller made it a point to visit a number of institutions for backward children. He was astonished at the amount of freedom permitted many of these children and at the great responsibility carried by the teachers. When one considers the burden to a family and the amount of care necessary for the upbringing of one mentally retarded child in a household, it is easy to understand the burden of responsibility born by the head of an institution for 220.

The purpose of such an institution in the general and social education of its patients can be accomplished only by the establishment of reciprocal confidence between teacher and pupil. The choice of work is important. Backward children often prefer work that is dirty. The teacher must arrange his children in companionable groups.

Keller thinks that the institutions occasionally spoil the children for future life outside by making conditions too easy.

GERSTLEY, Chicago.

MORTALITY IN INFANCY AND CHILDHOOD. E. RIETZ, Acta pædiat. (supp. 3) **9**:1, 1930.

The author presents a detailed study based principally on the vital statistics of the four largest cities of Sweden in the years 1913 to 1927, inclusive. The close relationship of environmental factors — social, economic and hygienic — to infant and child mortality is abundantly demonstrated; in view of the local nature of the material analyzed, however, the article does not lend itself to abstraction.

MCINTOSH, Baltimore.

DETERMINATION OF SMALL QUANTITIES OF PHOSPHORUS BY TITRATION. MARTIN ODIN, Acta pædiat. **9**:392, 1930.

As in Iversen's method, phosphate is precipitated as ammonium phosphomolydate. The precipitate is then carefully washed and dissolved in an excess of twenty-fifth-normal sodium hydroxide. The ammonia is driven off by boiling and the residual alkali titrated with hydrochloric acid. The method is suitable for biologic fluids containing phosphorus in quantities from 0.5 to 0.015 mg., or the amount of inorganic phosphate contained in from about 10 to 0.3 cc. of normal serum. For the larger quantity the accuracy is better than 2 per cent; for the smaller quantity, it is about 10 per cent.

MCINTOSH, Baltimore.

COURTS FOR CHILDREN AND AUXILIARY SERVICES. ALEXANDER MAGILNICKI, Opieka Nad Dzieckiem **7**:53, 1929.

The author suggests the following: 1. There should be special courts for children. 2. The judges should be parents themselves. 3. Women judges are preferable for girls and small children. 4. A pediatrician should be connected with each court. 5. Teachers, social workers and representatives of children's institutes should take part in the care of these children. 6. The bringing up and training of these children should be under the care of the judges. 7. Everybody should take part in the betterment of the conditions surrounding these children, that is, the county, state, government, private and religious organizations.

KRUPINSKI, Chicago.

GREAT NECESSITY FOR THE PROTECTION OF HOMELESS MOTHERS AND INFANTS. M. REUTT BOREMSKA, Opieka nad Dzieckiem 7:62, 1929.

Boremska states that there is great need for protection of these mothers and infants in Europe, America and Australia. In her opinion special laws should be passed; homes, hospitals and special institutions could be built for these unfortunates, in which educational and religious training could be properly given with adequate medical care.

Laws should be passed to compel these mothers in cases of disease to take treatment for either themselves or their children. Laws should compel the father to contribute to the support of the mother and child. In Poland great progress has been made along these lines in spite of the fact that the country has been poor since the war.

KRUPINSKI, Chicago.

Society Transactions

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

April 10, 1930

F. Elmer Johnson, M.D., *Presiding*

Dosage of Ultraviolet Ray for Infants with Tetany. Dr. Harry Barwin and Dr. Ruth Morris Barwin.

The effect of measured amounts of ultraviolet radiant energy from mercury vapor quartz lamps on the clinical condition and serum calcium of twenty-eight infants with tetany was studied. The intensity of ultraviolet ray emitted by the burner was determined daily by the oxalic acid-uranyl sulphate method of Anderson and Robinson, and the time of exposure of the child varied so that a constant dosage was given to each child. The same dosage was given during the entire course of treatment of each child and not in increasing amounts, as is customary in clinical practice.

When very large doses of ultraviolet ray (from 60 to 160 oxalic acid units, corresponding to an exposure of six minutes or more at 50 cm. distance with a good burner) were given daily, the average daily rate of rise of the serum calcium was 0.23 mg. per hundred cubic centimeters. When doses of ultraviolet from 8 to 38.5 oxalic acid units were given, the average daily rise was 0.4 mg. per hundred cubic centimeters. With smaller doses (from 4.5 to 5.0 oxalic acid units, corresponding to an exposure of from thirty to forty-five seconds at 50 cm. distance with a good burner) the average daily rise was 0.24 mg. per hundred cubic centimeters. It is apparent from these observations that in the treatment of infants with tetany by means of ultraviolet radiant energy there is an optimal range of dosage above which and below which the rate of rise of the serum calcium is slowed and the time necessary for cure correspondingly prolonged.

When ultraviolet radiant energy of optimal dosage for treatment in tetany is used over long periods of time, there is a tendency for the serum calcium to fall, after a few weeks remaining, however, within normal limits; and the serum inorganic phosphorus to rise to levels higher than those ordinarily observed in healthy infants.

The influence of race (colored or white) on the reaction of infants with tetany to measured doses of ultraviolet radiant energy was studied. With large doses and with doses in the optimal range there is no striking difference in the rate of rise of the serum calcium. When smaller doses are used, however, there is a distinct difference, the serum calcium rising at a slower rate in colored than in white infants. When adequate dosage is used, therefore, the rate of rise in white and in colored infants is the same, but the minimal dosage necessary to raise the serum calcium is greater for colored than for white infants.

Because of the great variability in the intensity of radiation emitted by various burners, and by the same burner at different times, it is urged that some method for lamp testing be generally used. Generally speaking, a dosage of two minutes for the front and two minutes for the back at a distance of 50 cm. should give optimal results in the treatment of patients with tetany, unless the burner is badly deteriorated.

CEREBRAL DOMINANCE AS A FACTOR IN THE ACQUISITION OF SPOKEN AND WRITTEN LANGUAGE. DR. SAMUEL T. ORTON.

This paper is to be published in full.

DISCUSSION

DR. HOWARD W. POTTER: Dr. Orton's work should be of much interest to all those who are interested in child development, child training and psychiatric problems of childhood. To one who has spent much time in work with problem children, the views of Dr. Orton relative to cerebral dominance are especially intriguing.

There are two groups of problem children in relation to whom this question of cerebral dominance must be carefully considered. That large group of children who have difficulty with their school work, and I refer especially to the so-called high grade moron, borderline and dull normal group, certainly present many inconsistencies in the clinical picture. Many of them have reasonably good common sense and judgment, and are successfully able to compete socially and economically in situations that do not involve what might be called "a book-minded intelligence." I am firmly convinced that the key to a better understanding of the capacities and incapacities of these children is to be found in the field of their cerebral dominance, and the difficulty, although organic, is free from actual structural elements. I have often speculated on the possibility that there is some specific method of teaching these children which will circumvent the defect in a manner similar to that by which this has been accomplished with specialized technics in teaching the deaf and dumb. It is interesting to note, in this respect, that high grade mental defectives learn to read, and the progress is almost twice as rapid, when the phonetic method is used as when the sight method is employed. It might be profitable for us to take rather more seriously the principles of physiologic training laid down by Seguin over half a century ago.

The question is continually occurring to me as to what is at the basis of this failure of cerebral dominance if, as Dr. Orton believes, it is not a structural defect; with this belief I am in accord. Is it a part or a consequence of an emotional state, possibly incurred through faulty social environment? Here is a question for further research.

We must not overlook the extremely important secondary emotional and personality reactions to the failures which are greatly in evidence in the child's life as a result of the failure to establish a cerebral dominance. These secondary reactions, incidentally, are of as much if not of more importance in the all-important function of social adaptation. Feelings of difference, which the manifestations of a faulty cerebral dominance are bound to create, have an extremely detrimental effect on the personality. Some children will retreat into themselves, as it were, others will show irritability and emotional instability, while others may make an attempt at compensation by marked conduct disorders.

I should like to stress the importance of treating the child as a total personality in his social environment as well as of attacking the underlying problem of cerebral dominance by special teaching technics.

DR. FREDERICK TILNEY: After listening to Dr. Orton's presentation, I think you all will agree that his conception of education really reaches down to the roots of the question.

His recognition of the different platforms in the sensory organization of our lives to me is one of the most useful and most illuminating steps forward in understanding how the cortex works. This entire matter of cerebral dominance, of course, has behind it the secret of the development of the cortex. Why did the cerebral cortex come into existence? We know that for a considerable period in organic life there was no such structure. Thousands of animals and many different species got along in life and in behavior adjustments without it. In fact, it was not until that critical phase of progress when the mammal made its appearance that the cortex appeared.

What has impressed me in thinking of Dr. Orton's work is the question of what influences urged on this great expansion in the brain which finally gave us the best instrument we possess.

Although any theory must be advanced tentatively and remain in many respects conjectural, I think it safe to say that the great drive behind the development of the cerebral cortex was body sense, that is to say, that part of our sensory organization which has to do with the sense of feeling in the muscles, joints and skin. It is interesting to note that at exactly the time when the cortex first began to appear, a great and critical change occurred in organic life, namely, the appearance of the skin as a sensory and adjusting organ, an organ covered with hair and capable of complex contacts with life.

As the brain develops embryologically, the first signs of the cortex occur in that region which represents the body sense, i.e., the parietal region. This is also the case in very primitive Eocene mammals. The senses of vision, hearing, taste and smell were all provided for in the lower animals, like fish, reptiles and birds, but the body sense was not so well provided for. And so to find a region adequate for its expansion the cortex became a necessary expansion. It soon called on other senses to join it, so that vision, taste, smell and hearing ultimately entered the neopallial regions.

At first in the mammal brain there was not much distinction between the two sides of the body. In man, who represents the highest stage of brain development, Dr. Orton has shown that there is a dominance in those who develop normally. We have dominance of either the right or the left side. Such dominance did not manifest itself until we were pretty well up in the scale toward man. Something occurred then which led to this dominance, probably, as Dr. Orton has pointed out, the development of right or left handedness. This development in itself seems simple, but it becomes an important factor in view of the many things we do with our right hand in which the left hand is more or less passive. This fact put into relation with the development of speech, according to modern theories, reveals the intimate relation that right-handedness or left-handedness bears to the production of speech, written or spoken.

Sir Richard Paget has developed a theory that speech begins as gestures. He made close studies of primitive speech among the Polynesians, and thinks of speech fundamentally as a gesture. The gesture is ultimately transferred from gesturing organs to the mechanisms capable of producing articulation.

We are familiar with Herbert Spencer's views on this matter as expressed in his noted essay on "The Philosophy of Style," in which he says that it means a great deal more to point to the door than to say, "leave the room," or to lay a finger on the lip than to say "be quiet," or to raise the eyebrows than to phrase a question.

To my mind the matter of right-handedness or left-handedness is of great importance in determining cerebral dominance. If it may not seem obtrusive, I should like to cite my own case. I am left-handed. I have three brothers, one of whom is also left-handed. On the paternal side of my family, there is no left-handedness, although my maternal grandfather was left-handed. Early in life this fact was noted. One of my earliest influences was an extremely conscientious and determined Irish nurse. She decided to make me right-handed. Her method depended on tying a stocking on my left hand whenever I tried to write or draw. In time, I, as a result of this discipline, became right-handed. I wrote with my right hand, but in everything else I remained left-handed. I threw a ball, played tennis and shot with my left hand. When I first began to enter into athletic sports, I was taught to use my right hand, and I did so very poorly. From these facts there can be no question as to what dominance I had. It may have been mixed, but for the most part, it was right-sided. I have always had a great deal of reading disability. I was extremely slow in learning to read, and many of the things that Dr. Orton has shown us on the screen are quite familiar to me. I had great difficulty in handling foreign languages. It was a trial to read and to speak them.

About four years ago, it became necessary for me to learn to write with my left hand, and since that time, I have noticed a greater facility in writing. My production in writing is better. I do not leave out syllables or endings of words as I did, and I think I can notice some change in oral speech production.

Dr. Orton has laid before us a most important fact in the training of children, although it need not necessarily be limited to that level.

Dr. Orton is coming to Columbia in a professorial position. Accordingly, we shall have an opportunity to profit by his work, and we hope in the near future to establish clinics for the treatment of reading and writing difficulties in children.

DR. SAMUEL T. ORTON: I think Dr. Tilney's recital intensely interesting. I interpret the situation thus: He was primarily a left-handed person and probably sufficiently strongly so that the training toward right-handedness did not interfere very much with his cerebral leads. I think we have to recognize the fact that there are some persons so strongly left-handed that nothing that we do to them will do any harm. It is only those on the borderline between the two extremes, who get into difficulty. Dr. Tilney's early training may have been something of a handicap, but I think it was merely a mistraining. It is clear from his experiences in both writing and speech that this is true, and it suggests that he is now working more in harmony with his native physiologic bent.

In regard to Dr. Potter's discussion, there is very little that I can add, except that I think there are certain fairly fixed patterns of the emotional results, the apathetic, the inferiority, the emotional block and the paranoid. The first three are self-explanatory and easily understood. The last is uncommon and occurs usually only when the parents have told the child, "It isn't your fault that you can't write, the teacher is no good." The child is all too quick to accept this attitude and adopt the paranoid attitude about the whole school situation.

THE CONSERVATION OF THE SCHOOL CHILD'S HEALTH. DR. WILLIAM ROSENSON.

The past decade has witnessed an ever-widening interest in the field of preventive pediatrics. The large number of physical defects revealed during the routine examination of our young men enlisting in the World War clearly demonstrated the need for more intensive study and correction of physical abnormalities in childhood. The more recent rise in the number of social maladjustments, psychoneuroses and psychoses and the rather startling increase in juvenile delinquency and crime have focused the attention of the nation on the child from the standpoint of mental hygiene. Numerous organizations initiated and sponsored chiefly by laymen are seeking to solve these problems of child health. The White House Conference on Child Health and Protection recently established by President Hoover is national in scope.

In New York City the public school system, with an enrolment of more than a million children under trained guidance during a large part of the day, offers a splendid opportunity to put into practice on a broad scale our accumulated knowledge of physical and mental hygiene.

Already considerable has been accomplished. Preschool vaccination against smallpox, the general application of the Schick test and the use of toxin-antitoxin for immunization against diphtheria have become part of the regular school program. The inauguration this year of a new system of medical inspection, the "squad" system, consisting of medical examinations by three physicians, each taking special parts and working together during the same period, is a distinct improvement over the old method, The development of special small classes for the handicapped children and those with cardiac disease, open air classes for the anemic and markedly undernourished and special classes for the mentally defective, those with poor vision and the physically crippled have helped to alleviate the disabilities of many children. In some instances complete restoration of health has been accomplished.

There are, however, a number of conditions, customs, rules and regulations still extant in the system which are unquestionably inimical to the physical and mental health of the child. These produce definite abnormal states: school sickness or "occupational disorders of the school child." Some of these conditions would be condemned in an industrial plant. The facts on which this study is based have been obtained by taking school histories of patients, from talks to intelligent parents, to teachers and principals and personal visits and inspection of a number of schools. The disorders produced are referable to the gastro-intestinal tract, with symptoms of vomiting, abdominal pain and constipation; to nutrition, underweight and anemia; to the respiratory system in undue exposure; to the nervous system with symptoms of chronic fatigue, nervousness and irritability, tics and abnormal behavior. Only by careful inquiry into the school life of children are the causes of these manifestations ascertained. Just how these conditions are produced will be brought out in the discussion of the following problems.

The Lunch Period.—The recess allowed for the school child's lunch is fifty minutes. This must include the time required to leave the school building, to travel home and back to school (often seven or eight blocks each way), to eat lunch, to attend to necessary wants and in walking to guard against accidents by watching the traffic and the traffic signal system. This is an impossible task, and what happens is that the child either eats an inadequate lunch or gulps his food. Not infrequently in its mad rush back to school the child suffers from abdominal pain and vomiting. The symptoms are due both to the nervous strain entailed and to the rapid ingestion of the food. Seham, who has made a complete study of fatigue in the child, says of the luncheon period, "Every child should be required to remain at the table for thirty minutes. Before returning to school he should spend fifteen minutes in complete relaxation. This rest coupled with the walk home from school will help to neutralize the morning's fatigue."

In response to a questionnaire sent to the boards of education of the ten largest cities of the United States ranking next in population to New York regarding the time allotted for the school lunch recess, the following answers were received:

Chicago	1 to 1¼ hours
Boston	1¼ hours
Philadelphia	1½ hours
Pittsburgh	1 to 1¼ hours
St. Louis	1 hour and ten minutes
Baltimore	1¼ hours
San Francisco	1 hour
Detroit	1¼ to 1½ hours
Cleveland	1½ hours
Los Angeles	1 hour

New York allows fifty minutes for its childrens' lunch, the shortest period of any large city. There is no doubt that such a schedule has a definite harmful influence on the nutritional state of many children, especially those already constitutionally below normal. The lunch period should be extended to one and one-quarter hours.

A number of schools have a double session. Those who attend the early session are dismissed for lunch at 10:50, and the children are asked to eat their mid-day meal at about 11:00 a. m. They may adjust themselves to this new arrangement when shortly they are placed on another schedule. The frequent changes make it difficult to inculcate proper feeding habits. A mother having several children in the system may be compelled to serve lunch at several different hours. An endeavor should be made to accommodate the child to a reasonable routine.

Some schools have lunch rooms. Of these, the School Lunch Inquiry Committee reported that "indiscriminate and often unhealthy food" was being served

to the city's school children by an "objectionable concessionaire system," and recommended that provisions be made for an "assistant director of homemaking to operate school lunches." This fine work should be supported.

Overemphasis on Attendance.—Promptness and regular attendance should be encouraged in the classroom, but when these become overstressed they become subversive to good health. In many schools the attendance record is made the subject of keen competition between the classes, and a large placard marked 100 per cent is shown on the door of the classroom that has no child absent during a designated period. If a child is absent even for a grave illness, the class loses its coveted glory. At times the absent child is punished on its return by being placed in the last row with the poor students. In a number of cases such irrational procedures have a deleterious physical and emotional influence on the child. He will hide early symptoms of disease in order not to spoil the class record, and the fear of being disgraced on return to school produces a pronounced emotional strain during an acute illness. A child with an infection of the upper respiratory tract should remain at home for a day or two, especially during the winter. The overemphasis on the attendance record often brings a child to school only to intensify his own symptoms and to spread the infection in the classroom.

The severe punishment often meted out to the tardy child and the overemphasis on the subject in the classroom often make the morning rising an unwarranted hardship. While preparing for school, the child is in constant fear of being late. His appetite for breakfast is frequently impaired, and the morning vomiting of school days is a common occurrence. The treatment of the problem of attendance should be handled in a more rational way.

After-School Activities.—The school work day of the child does not terminate with the close of the school hours. He is sometimes "kept in" after hours as a punishment for some more or less serious offense. This not only leaves less time for his outdoor exercise, but exposes him to the hazard of crossing the main street without the protection of the police officer who has already left his post.

In a number of schools additional physical exercise is given one day a week in the afternoon between 3 and 5 p. m. In the older schools this exercise is given in the indoor basement yards, which are damp and draughty, the air often being permeated by the odors of the nearby lavatories. When, after this strenuous day, two or more hours of homework are assigned, the whole job of the school child becomes one that no adult would tolerate. The conscientious child frequently does not retire until 10 or 11 at night, only to have a nervous and restless sleep. Especially is this problem acute with girls at puberty, when freedom from physical and undue emotional stress is most essential. They are usually in the higher grades, and for them the work is usually made most difficult. The carrying of books weighing in all from 12 to 14 pounds to and from school, changing classrooms every forty-five minutes, rushing out for lunch, after-school activities, compulsory visits to museums and libraries and then two and three hours of homework is a program that is undermining the health of many adolescent girls and producing in them a chronic state of fatigue. In some schools the amount of homework has been reduced during the past year. The importance of such reductions should be more generally recognized and enforced.

Sanitary Conditions.—In a previous paper I presented the details of an inspection of the children's lavatories in a number of schools. For lack of time I shall but summarize the observations. The lavatories are not properly supervised or protected, and are frequently filthy, inadequately flushed, surcharged with an ammoniacal odor and without tissue paper. Children from homes of good standards find it impossible to use the school lavatories, and often suffer unnecessary discomfort. Constipation sometimes ensues. No adequate facilities are provided for washing the hands, neither soap nor towels, in any school lavatory. While children are taught the importance of cleanliness and hygiene in the classroom, no efforts have been made to provide them with the first essentials to carry out these teachings.

In some of the old buildings the lavatories are out-houses, and the approach is through an open unprotected yard. In the winter, children pass without overclothing from the heated schoolhouse to the open space, subjecting themselves to the hazards of respiratory infections.

Under the part time schedule the indoor yard, where the pupils usually congregate before being sent to the classroom, is frequently used for classroom work when children of the next session gather outside. In stormy, inclement weather, the latter are compelled to wait outdoors until the indoor yard is completely vacated. Some adequate protection should be provided.

Mental Hygiene and the School Child.—For the prevention of mental derangements and criminal tendencies there is no more important subject today than that of mental hygiene in childhood. The school child, in the classroom one third of his waking hours, is tremendously influenced by the teacher in his mental and emotional reactions. I have seen the metamorphosis of the nervous, irritable, morose, unhappy child into a normal, calm and joyous personality by the change of a teacher. I have seen tics and enuresis disappear in a similar way. The loud scolding, unsympathetic teacher creates a spirit in the classroom that brings out the worst antisocial instincts, and in the sensitive child marked emotional fatigue develops. The teacher who sets herself on a pedestal and lords it over the class emphasizes the feelings of inferiority in the children, and in some instances tends to create compensations destructive to the general welfare. It has been repeatedly demonstrated that such behavior reactions as lying and stealing may depend on some minor factor in the environment at home or in the school, which if detected early and corrected will change the child's entire outlook. The individual study of a child's capabilities and the adaptation of the curriculum to his special needs will cure many behavior problems.

The public school system of our city has not yet made adequate provision for the utilization of our growing knowledge of this aspect of mental health. The New York City Committee on Mental Hygiene of the State Charities Aid Association states, "Nowhere in the entire system is there a single piece of co-ordinated mental hygiene work."

I feel that the number of children in each class should be reduced. It is impossible to expect one teacher to give intelligent care to forty-five and fifty children (at times even more) presenting so many different problems. She can hardly take the time to select the unusual child requiring special study. The maximum in a classroom should be thirty-five.

While many teachers are already cognizant of the newer methods of approach, the majority are not sufficiently equipped. Courses in mental hygiene should be made compulsory for the teacher.

The visiting teacher is an important link between the school and the home, and her influence on the whole environment of the child can be of inestimable value. At present there are but 23 visiting teachers in the school system with over 500 schools. The ultimate aim should be one visiting teacher to each school.

Mental hygiene clinics or advisory councils should be established in each district for the study and treatment of special behavior problems. At present but one psychoeducational clinic is maintained by the department, and outside private agencies are endeavoring to supplement this work in a few schools.

The program outlined here calls for the expenditure of considerable effort and funds. The returns, however, in stronger, physically and mentally healthier and happier children will undoubtedly justify our efforts. From the long range point of view it would be an economic gain as well. I feel confident that if through the organized medical profession, especially the pediatricians, the board of education became aware of the importance of the preventive health needs of the school child, its cooperation would be assured.

DISCUSSION

DR. MURRAY H. BASS: I think that as physicians, we are prone to forget this whole subject. When one considers how many children are going to school in the public schools here in New York, one realizes how great a chance one has

to do good. Dr. Rosenson should be supported in this work. He has been emphasizing this subject for a number of years. He read a paper on it before the County Society and is on a committee of the County Medical Society which is trying to do something in this matter. I think that we should support him in every way possible.

Everyone who treats children is confronted with this situation every week. Not a week goes by that I am not asked to write an excuse for a child of 6 or 7 years, who needs more fresh air instead of returning to school for the afternoon session.

The question of the physical conditions in the school really does not so much belong to us, but the shocking conditions in some of the schools are surprising. I know an investigation was made by the Teachers' Union, and conditions such as Dr. Rosenson mentioned were found in a number of schools. It takes a great deal of work, but these conditions can be changed; and if each of us would do a little to help it along, I know that we would be doing a great deal of good.

DR. MARSHALL C. PEASE: I feel like correcting what Dr. Bass has said, in that we meet these problems not every week but every day. I am grateful that the subject has been brought to our attention and in such an illuminating manner. I do not see how pediatricians can entirely disregard it. I think that everything Dr. Rosenson has said is true and more than true. I think it is not only true of public schools, but to a certain extent of private schools. I have a couple of boys in private schools, and I assure you the pressure is just as great, if not greater, than in the public schools. I feel that this is a matter which is very close to us all, and that some action should be taken to make these observations concrete.

DR. F. ELMER JOHNSON: Do you think children should go to school at all in the afternoon.

DR. LOUIS C. SCHROEDER: I should like to ask Dr. Rosenson what he thinks of the indiscriminate giving of milk and a morning lunch or of having any lunchroom at all.

DR. WILLIAM ROSENSON: Answering Dr. Johnson's question about afternoon school hours, I believe that during the first two years children should attend only the morning session. If the classes could be made small enough and the curriculum adequately adhered to, it would be good, but this could be accomplished only in the first two years now.

As to milk in the mid-morning, I think it is rather a waste and not worth while. Giving milk at 10:30 or 11 is spoiling the appetite most of the time. I do not think it was prescribed by any medical body.

The establishment of good lunch rooms would be worth while if they were supervised as recommended by the lunch inquiry committee of the school. So many children live so far away that a good hot lunch in a clean, sanitary room would be worth while.

I want to thank Dr. Bass and Dr. Pease for their support.

CHICAGO PEDIATRIC SOCIETY

Clinical Meeting, Sarah Morris Memorial Hospital, April 15, 1930

A. LEVINSON, M.D., *Chief of Staff, presiding*

AGRANULOCYTOSIS. Presented by DR. PHILIP ROSENBLUM.

A boy, aged 6, gave a history of an acute infection in the nose and throat about a year before presentation. Soon afterward the cervical glands became enlarged and one ear opened spontaneously. I saw the child first about one week after he became ill, and he was brought to the hospital in May, 1929. At that

time the hemoglobin was 30 per cent, red cells 1,500,000, white cells 3,000, and no granulocytes. His tonsils had been removed when he was 4. While he was in the hospital an ulceration developed behind the posterior pillar on the right side, the right ear continued to discharge and the left ear opened spontaneously during the month he was in the hospital. About one day before it opened there was a drop in the temperature, granulocytes appeared in the blood, and in this way one could tell that he was improving. He was given two blood transfusions and allowed to go home, but in a short time there was a flare-up in the right mastoid, with swelling over the mastoid, and he was again brought to the hospital. The mastoid was operated on, and the child again made marked improvement following two blood transfusions. He was in the hospital on that occasion for six weeks. The right mastoid did not heal perfectly, but the hemoglobin increased to about 80 per cent, and granulocytes appeared in the blood; there was no elevation of temperature for some time, and the patient was in good condition. He was discharged from the hospital and remained at home for a short time, but then he returned with another throat infection. This time the ulceration extended down into the bronchi, and an empyema developed. With the appearance of the empyema the white cell count rose to 22,000, and after he recovered from the empyema, granulocytes appeared in the blood to about 60 per cent. The child made a fairly good recovery, with a few relapses. Finally after the right mastoid had been reopened and packed, it did not heal properly, but the patient apparently made a good recovery except for drainage from both mastoids. After about ten days a cervical adenitis developed, and again there was reduction in the white cells, absence of granulocytes, a drop in the red cells and in the hemoglobin.

At this time he is just recovering from a mass of glands in the left cervical region; the left mastoid is still draining, and the right has healed.

I thought that this patient would be of interest because the outcome is a little different than in the cases reported by Dr. Brenneman and Dr. Bigler. At the time the empyema developed he had leukocytosis. It was apparently a different type of infection than that which occurred in the nose and throat. It will be interesting to watch further progress of this case.

IMMUNOLOGIC PHENOMENA. Presented by DR. I. HARRISON TUMPEER.

Passive transfer is an indirect method of testing for hypersensitiveness or allergy. Twenty-four hours before presentation, a nonsensitive person was inoculated intradermally with blood serum of a patient with ragweed hay-fever. Ragweed extract was inoculated into the sensitized area and in the normal skin of the same subject as a control. Within ten minutes there appeared a typical urticarial wheal with itching at the site previously sensitized, while no reaction occurred at the control area.

This method of indirect testing has several uses. First, it demonstrates that the hypersensitive person has some type of antibody which may be transferred to a normal person. Secondly, where dangerous constitutional reactions are feared with the intradermal method of testing, it is safer to perform the test by passive transfer, since the recipient is sensitized only in the areas inoculated with the patient's serum. Thirdly, this method is a convenience in children where there is lack of cooperation or danger of a constitutional reaction. Fourthly, there are patients whose skin tests fail because of a lack of reactivity. In interpreting passive transfer, it must be remembered that some recipients do not respond.

The Arthus phenomenon in man originally was described in rabbits receiving successive inoculation of horse serum. A series of changes occurred until the final development was an area of necrosis with subsequent sloughing.

The patient presented was a child 5 years of age who had received the three inoculations of horse serum toxin-antitoxin at weekly intervals in 1926. On March 27, 1930, she received 1,000 units of diphtheria antitoxin in the left gluteal region. Within a few hours this area became red and swollen. The next day there were urticarial lesions locally that became more scattered the next day. Two days

later a sore throat and fever developed, and the following day the culture contained diphtheria bacilli. She was given 15,000 units of diphtheria antitoxin in the left gluteal region. This area became enormously swollen, and a purplish spot developed in the center surrounded by satellite swollen areas. During the next ten days the process extended to involve the entire right buttock, the right lower quadrant of the abdomen, extending somewhat over the midline to the left, and to the right labia. These areas gradually became gangrenous. A spot appeared at the posterior surface of the knee, and the knee became swollen and tender. Bullae filled with serous fluid formed around the periphery of the gangrenous area. From this time on, the gangrenous mass became sharply circumscribed and sloughed. On the twelfth day the abdominal area was incised and a quantity of thick yellow-green pus was discharged containing a diplococcus. The slough finally exposed the muscles of this region; the fascia had disappeared in the slough. Cases resembling this were described by Gatewood and Baldridge in 1927. They reported a similar case in a nurse and described several reactions of lesser intensity. Striking features are the fact that minute doses of horse serum that are present in toxin-antitoxin are especially apt to sensitize the patient; secondly, this phenomenon is more apt to occur if the horse serum is administered in the presence of a serum reaction such as urticaria; thirdly, there are ususally signs of joint involvement which one also finds in simple serum sickness. The patient presented illustrated all of these features.

CIRCUMSCRIBED, PERFORATING TUBERCULOSIS OF THE SKULL. Presented by DR. JOSEPH K. CALVIN.

This is the second case of this type that has been seen here, for in 1925, Dr. D. C. Straus presented a similar one at this hospital. There is little in the American literature on the subject, but there is considerable in the German literature.

This boy was 27 months of age at the time of presentation, and was first admitted to the hospital when he was 15 months of age. There was no history of tuberculosis in the family. The histories of his birth, development and feeding were normal. His parents stated that he had never had much "pep" and had always been pale and tired, but that he had had no acute illness, colds or coughs before the symptoms appeared in January, 1929. At that time the mother noted a gradual swelling in the right frontal region of the skull, which reached the size of an egg. There was no tenderness, pain, heat or redness. Three months later a similar swelling the size of a walnut appeared on the dorsum of the right hand. A similar swelling the size of an egg was then noticed along the left mandible.

When the child was admitted to the hospital, the diagnosis of tuberculosis was not made, although now I realize that this was the only diagnosis that could have been made, considering the roentgenographic observations. The patient was apathetic and anemic, but not acutely ill. There was a hard bony, painless swelling over the right frontal region and one along the mandible. There was a swelling along the dorsum of the right hand which later became infected from aspiration and was curetted. Also there was a swelling of the right radius and the left tibia. These swellings or bony tumors varied from the size of a walnut to that of an egg and showed no evidences of acute inflammation.

The laboratory observations showed a Bence-Jones protein in the urine, which may appear in any extensive disease of the bones. Examination of the blood showed 8,500 white cells, with 65 per cent lymphocytes. A secondary anemia was present. The blood calcium and phosphorus were within normal limits. The Mantoux test was positive in a dilution of 1:1,000. The Wassermann reaction was negative.

The differential diagnosis of bony tumors had to be considered because that was the outstanding observation. Syphilis, tuberculosis, multiple myeloma, chloroma, multiple bone cysts and metastatic malignant tumors had to be differentiated.

Although there was no external evidence of inflammation when the patient was admitted, one of the swellings later developed into what appeared to be a cold abscess. Pus from this was inoculated into a guinea-pig, which later developed typical regional glandular tuberculosis. Even without these two positive observations (tuberculous guinea-pig and positive Mantoux test) this peculiar type of circumscribed, perforating tuberculosis of the skull is typical, as you will see in the x-ray films. (Lantern slides were presented.) Syphilis never produces the sharply punched-out appearance of the skull that is noted in tuberculosis. The bony tumor had disappeared, but the punched-out, definitely circumscribed, perforated area involving the entire thickness of the skull was still evident. The roentgenogram of the left mandible showed marked swelling and rarefaction. The right radius and left tibia showed a definite periosteal thickening which cannot be distinguished from syphilis.

The German textbooks stated that these were all surgical cases, that the skull should be completely excised down to the dura and all the infected material removed. Otherwise, eventually perforation of the dura would occur with the development of tuberculous meningitis.

ASCITES. Presented by DR. ARTHUR ABT.

An infant boy 9 months of age was admitted to the hospital two months ago. The history stated that three weeks before presentation the child had a cold and a temperature of 104 F. for several days. At about this time the mother noticed a swelling of the child's abdomen, slight at first, but gradually increasing so that for one week prior to admission the abdomen was quite swollen. The patient was given three enemas in one day, but there was no reduction in the size of the abdomen. There was no jaundice at that time; the appetite was fairly good; the stools were green, but they contained no blood, mucus or pus.

The history of the child's birth was normal, and there was nothing of importance in the family history; there was no record of tuberculosis or syphilis in the family. The child showed no adenopathy, skin eruption or rhagades. The chest was clear. The liver and spleen were palpable, and the abdomen showed a fluid wave. No venous engorgement was noted.

The laboratory tests showed the urine to be normal. Examination of the blood showed a slight anemia, with 55 per cent hemoglobin. No malarial parasites were found. The bleeding time and the number of platelets were normal. There was no gross or microscopic blood in the stools; the benzidine test for occult blood was positive. The Wassermann and Kahn tests on the parents and child gave negative results. The Pirquet and Mantoux tests, 1:1,000 and 1:2,500 were both negative.

The abdomen was tapped shortly after the child's admission, and 450 cc. of yellowish-green exudate was obtained. The specific gravity was 1,009, and there was a heavy precipitate of globulin. No organism was obtained from direct smear or from a twenty-four hour culture. A guinea-pig was inoculated nearly two months previously, and when it was killed the day of presentation, it showed no trace of tuberculosis or other infection.

The child's course in the hospital had been uneventful, except for a slight attack of otitis media from which it made a good recovery.

In the differential diagnosis of ascites, the tuberculous wet type of peritonitis is most common in children. A factor against this diagnosis was the absence of tuberculosis in the family history and the negative tests. A syphilitic liver may cause ascites, but there was no history or evidence of syphilis in any part of the body. Malignancy of the liver, spleen or mesentery, by pressure on the portal circulation may cause ascites, but against this was the absence of glandular involvement. Leukemia and some other blood conditions cause ascites; also thrombosis of the portal vein, but with involvement of the portal vein evidences of hemorrhage are found. Disease of the liver itself causes ascites, but none of these possibilities fits this case exactly.

The child is getting meat broth with liver in it, which may account for the occult blood in the stools.

INDICATIONS FOR OPERATION ON THE MASTOID. Presented by DR. JULIUS H. HESS.

There is a question as to whether there has recently been an epidemic of acute mastoiditis in Chicago. Thirty-four cases have been reported, nine in the past four weeks. Bilateral operation was done in seven of the thirty-four cases. There were eleven cases in males and twenty-three in females. Eight patients were operated on before 3 years of age, eighteen between 3 and 6 years, and the remaining eight between 6 and 12.

Ordinarily otologists have been averse to operating on mastoids until the infection is at least three or four weeks old, thinking that earlier operation adds to the danger for the child. The average time from the beginning of ear trouble to the time of operation in this group was three weeks. Twelve patients were operated on by the sixteenth day of their illness, one on the fourth day, one on the seventh and two on the eighth.

The chief indications for operation in these cases were septic curves that could not be related to any other source than the ear. In all of the cases in which I have witnessed the operation there was a distinct surgical process.

There were a considerable number of complications. In one case there was a marked bilateral suppurative cervical adenitis. In two cases there was an agranulocytosis, and in the second one of these a generalized sepsis developed before death. One patient showed the Gradenigo sign. There was one case of lateral sinus thrombosis, one streptococcic meningitis; in this case operation was performed twelve hours after the diagnosis of meningitis was made. These complications antedated operation.

This report will be of little value unless those who have had recent similar experience offer free discussion.

DISCUSSION

DR. LOUIS J. WISCH, Whiting, Ind.: I have had five cases in private practice, three in children below 3 years of age, and two in children about 5 or 6. All of these patients had severe diseases of the ear, of which we have all seen many cases this year. In one instance the father did not want a physician called because he thought that the child was not sick enough. The result was that when the patient was seen a periosteal abscess had already formed. The infection was high at the auricle. In all cases there was rapid healing, probably due to the fact that they were seen so late.

DR. JULIUS H. HESS: Most of the cases that I saw did not show any external evidence of periostitis. I do not recall any case in which an operation was performed before the second week that showed breaking through of the outer wall of the mastoid. Due to the fact that some pneumatization of the mastoid was still visible in some of the cases, the surgeons were at first inclined to conservatism. In all but one case hemolytic streptococci were recovered. In one agranulocytic case a hemolytic staphylococcus was isolated.

SUBACUTE, BACTERIAL ENDOCARDITIS. Presented by DR. JESSE R. GERSTLEY.

This specimen is from a boy, aged 13, who entered the hospital in December, 1929, and died in March, 1930. Death occurred from subacute bacterial endocarditis. The specimen is shown for two reasons. In a recent issue of the *Journal of the American Medical Association*, Sprague reported a number of cases showing that subacute bacterial endocarditis frequently developed on a rheumatic basis. This specimen demonstrates this excellently. You will notice the thickened chordæ tendineæ attached to the heart valve, evidencing former rheumatism. In addition, you will notice the vegetations of the bacterial endocarditis.

The specimen was shown also as a short study in focal infection. It is surprising that in the vast amount of literature dealing with the importance of focal infections little scientific work has been done to establish such relationship.

In this boy, blood cultures at first gave negative results. Then two successive cultures showed *Streptococcus viridans*. Culture from the abscessed root of an extracted tooth showed *Streptococcus viridans*. The cultures made at autopsy from the valves of the heart showed *Streptococcus viridans*. Apparently it was a clear case.

But when one makes a more detailed study, and attempts to classify these different *Streptococci viridans*, it becomes evident that the organisms in the tooth were entirely different from the organisms in the blood and in the heart valves. The case is presented to show that, although *Streptococcus viridans* may be present in the dental abscesses, in the blood stream and in the heart valves, one should not form final conclusions without subjecting the material to further tests.

It seems to me that every case should be studied in this way and then sufficient evidence may be accumulated to evaluate the importance of focal infections in rheumatic and bacterial heart disease.

SUBACUTE, BACTERIAL ENDOCARDITIS. Presented by DR. S. A. WILE.

During the course of subacute bacterial endocarditis, a slow-growing tumor is sometimes noted, and is frequently thought to be a manifestation of a metastatic pyemic process or the coincidental occurrence of a neoplastic disease, while the possibility of a complicating embolic mycotic aneurysm is rarely considered.

A white boy, aged 10, was admitted to the Sarah Morris Hospital on Jan. 17, 1930. Three years before he had had a severe attack of rheumatic fever at which time a diagnosis of heart disease was made. He had a similar attack one year later. Five months before entering the hospital, he began to complain of pain in the left groin, fleeting pains in the joints and chilly sensations. The mother stated that there had been a daily elevation of temperature to 103 and 104 F., and that the child had grown pale and had lost weight. During the past month, he had been unable to extend the left leg because of the pain in the left groin, and the abdomen seemed swollen. Recently, she had noted several small reddish areas on the body.

The essential observations on physical examination were marked emaciation and pallor. The left lower extremity was held flexed at the hip and knee and could not be extended. The heart was enlarged with the classic symptoms of a mitral stenosis and insufficiency, and an aortic regurgitation. There was a moderately firm, tender mass in the left lower quadrant extending into the left flank and upward almost to the level of the umbilicus.

The laboratory observations were negative except for hemoglobin of 30 per cent, 1,800,000 red blood cells, and 29,000 white blood cells, with 80 per cent polymorphonuclears. A roentgenogram of the chest showed the heart to be enlarged. A culture of the blood was negative.

During his stay in the hospital, the child ran an irregular septic temperature. The mass slowly increased in size, and on aspiration a small amount of blood-tinged fluid was obtained. Two weeks after admission petechiae were first noted, and a blood culture at this time showed a nonhemolytic streptococcus. Because of the possibility of the mass being an abscess or a neoplasm, the patient was operated on two months after admission and at operation the tumor was found to be composed of laminated thrombi and red blood clot.

Necropsy was performed by Dr. Otto Saphir, to whom I am indebted for the following pathologic report.

"On opening the abdomen, there was a large retroperitoneal, semifluctuant tumor in the left iliac fossa. The pelvic organs were displaced to the right. On section the tumor consisted mostly of laminated thrombi and some free blood. The tumor had eroded the left pelvic bone. The tumor was removed in connection with aorta. On opening the left internal iliac artery, the mouth of the obturator artery was clearly seen. A probe inserted into it passed directly into the tumor. There were three small aneurysms of the superior mesenteric artery. The heart was enlarged and the aortic and mitral valves were retracted and sclerosed, and contained large vegetations."

Embolic mycotic aneurysms occur much less frequently in children than in adults. We have been able to find only sixteen cases in the first decade and fifty-four in the second. We were able to find no other report of a similar aneurysm of the obturator artery.

It is not an uncommon mistake to perform operations on these tumors. During the past four years, in eleven cases of embolic mycotic aneurysms of the peripheral vessels reported in the literature, four had been subjected to operation. This case emphasizes that a slow-growing tumor occurring during the course of bacterial endocarditis is probably an embolic mycotic aneurysm and should not be treated surgically.

SUBACUTE, BACTERIAL ENDOCARDITIS. Presented by DR. A. LEVINSON.

M. D., a girl, aged 11, entered the Sarah Morris Hospital on Dec. 28, 1929, with a history of fever for three weeks, a dry cough for one week and headache for two days. She had scarlet fever in June, 1929. She also had had measles, chickenpox and diphtheria. The patient had never been well since she was 3 years old, and the mother had known that she had heart trouble since she was 6. One brother suffered from heart trouble, and her paternal aunt and uncle had died of heart trouble.

On entrance to the hospital the child did not look acutely ill, but she was very pale. Her temperature was 100 F., pulse rate 124, and respiration 24. The heart was enlarged to the left. There was a systolic and presystolic murmur at the apex, and the second pulmonic was accentuated. The urine showed an occasional red cell. There were 3,900,000 red blood cells; 16,450 white blood cells; 70 per cent hemoglobin, 89 per cent of which were polymorphonuclear in type. On the day of admission, the culture of the blood and the Wassermann test gave negative results.

A diagnosis of pharyngitis and recurrent endocarditis was made.

Five and a half weeks later a painful red area developed over the upper third of the right forearm and twelve hours afterward there was an absence of the right radial pulse. The brachial pulse was palpable. Evidently there was an embolus in the right radial artery. At the time the embolus occurred the child suffered much from pain, and her temperature varied from 103 to 104 F.; the arm had to be suspended. The hand was cold, clammy and slightly cyanotic.

It is interesting to see how the collateral circulation of the hand and forearm will sometimes compensate for the presence of an embolus in the radial artery. The pain subsided in a few days, although the pulse was still absent at the time of presentation. The skin of the affected hand was shiny, but not cold or painful. About two weeks after the occurrence of the radial embolus, conjunctival petechiae were noticed. Since that time there had been a shower of them every few days. The majority of these petechiae were oval, with white, necrotic centers. These, I believe, sufficed to make the diagnosis of subacute, bacterial endocarditis. Three days after the appearance of the petechiae, there was a positive blood culture, and since then there had been still another.

On March 11, 1930, a severe pain in the right lower abdominal quadrant suddenly developed. This was accompanied by a rise in temperature, constipation and vomiting. Operation was suggested but was not done, because the plausible diagnosis was mesenteric embolus. The pain cleared up in three days.

After that time the case ran the usual course. The patient had the café au lait color usual in subacute bacterial endocarditis. There have been repeated petechiae, and another positive blood culture was obtained. It is interesting to note that the petechiae on the skin are round rather than oval and vary in size from that of a pinpoint to that of a pinhead, while those in the conjunctivae are practically always oval. The patient has been in the hospital for four months. Her temperature varies from 99 to 103 F., with an occasional rise to 104 F. She takes food well and moves her right arm in spite of the obliteration of the radial artery.

INFECTIOUS MONONUCLEOSIS. Presented by DR. JOSEPH GREENGARD.

A child, aged 10, was first seen in the office on Dec. 30, 1929, with a history of an illness of one week's duration. She complained of mild malaise, and at the onset there was puffiness around the eyes. Two days prior to entrance the parents noted enlargement of the glands of the neck. There was no sore throat, vomiting or cutaneous eruption. The past history was negative except for an attack of acute cervical adenitis and suppurative otitis media five years before.

On examination, the pharynx was seen to be injected, with engorgement of the lymphoid follicles of the posterior pharyngeal wall. The tonsils had been removed, but behind the posterior pillars were two large masses of hyperplastic lymphoid tissue containing a follicular exudate. All of the cervical glands were enlarged, firm, discrete and not tender. In addition, a generalized adenopathy was present, but less marked than in the cervical region. The spleen and liver were not palpable at the first examination.

Examination of the blood on this date showed hemoglobin 76 per cent, red blood cells 4,020,000, and white blood cells 22,500. The differential count showed neutrophils, 47 per cent; eosinophils, 2 per cent; basophils, 1 per cent; and mononuclears, 50 per cent. The urine was normal, and the Pirquet test gave a negative reaction. The temperature varied between 100.5 and 101 F.

Blood Picture in Case of Infectious Mononucleosis

Date	Hemoglobin, per Cent	Red Blood Cell Count	White Blood Cell Count	Neutrophils: Number	Neutrophils: per Cent	Eosinophils, per Cent	Basophils, per Cent	Mononuclears, per Cent
1/2/30	76	4,020,000	22,500	10,800	47	2	1	50
1/2/30	"	"	22,500	"	40	1	0	59
1/4/30	79	5,000,000	16,400	7,150	58	0	2	40
1/5/30	"	"	15,000	5,000	30	"	"	50
1/7/30	"	"	11,000	2,500	20	"	"	30
1/9/30	"	"	7,100	1,900	25	"	"	75
1/13/30	91	4,900,000	8,400	2,200	26	3	0	93
1/20/30	78	4,900,000	6,000	2,760	40	2	1	55
2/1/30	"	"	10,650	5,000	50	2	1	47

Because of the peculiar division of cells in the blood, we realized that we were dealing with some unusual condition, and the blood smear was examined more carefully. Typical abnormal mononuclear cells were found, and a diagnosis of infectious mononucleosis was made. The child was hospitalized for observation. During her stay in the hospital, the course was uneventful. She continued to have a slight fever in the evening and to feel a little below par. The urine was constantly normal, and the Mantoux test was negative. The blood picture is shown in the accompanying table.

The past history of an acute infection of the glands five years previously is of interest since it has been suggested that reaction to infection with a mononucleosis is based on the peculiarity of the patient. In examining the record of her previous infection it was found that she had a leukocytosis with a predominance of neutrophils. The same observation has been made in other instances which showed polymorphonuclear leukocytosis in response to infection after recovery from infectious mononucleosis. Production of leukocytosis by injections of foreign protein into patients who have recovered from infectious mononucleosis also results in a predominance of polymorphonuclears as demonstrated by Baldridge and others.

This condition is of importance, since it represents a benign type of pathology in which characteristic abnormal mononuclear cells occur in the blood, and which must be differentiated from other disease, such as acute lymphatic leukemia or Hodgkin's disease in which the outlook is grave.

(Lantern slides were presented demonstrating observations in the blood.)

DR. A. LEVINSON presented specimens of the brain and spinal cord illustrating cerebral and spinal hemorrhage in the new-born.

PHILADELPHIA PEDIATRIC SOCIETY

Combined Meeting with Philadelphia County Medical Society, May 14, 1930

JOHN A. MCGLINN, M.D., *President of County Society, in the Chair*

EXPERIENCES WITH BLOOD TRANSFUSIONS IN INFANTS AND CHILDREN. DR. ARTHUR H. LONDON, JR.

The blood of donors and recipients must be of the same type, and as a further check, it must be cross-agglutinated. If after half an hour, cross-agglutination shows some thickening of the suspension or any degree of agglutination on the one hand, or evidence of hemolysis on the other, the donor must not be used. When a donor has proved satisfactory, he must have negative Wassermann and Kahn reactions and a negative history of syphilis and malaria. Anemic donors are not satisfactory. The donor should fast three hours before having blood removed. Following repeated transfusions from the same donor, antibodies capable of causing hemolytic reactions may develop; therefore cross-agglutination tests should be made before each transfusion.

Transfusion may be performed by the citrate method or the direct method. The advantage of the former is the ease of administration. General usage has made direct transfusion mean the methods by which blood is transferred without the use of an anticoagulant. For direct transfusions during the past two years, Dr. London has used an instrument designed by Soresi, called the little factorum. Though not claiming it to be the best, he finds it simple to operate and practically fool proof. From experience with nearly 200 direct transfusions by this procedure and over 200 transfusions by the citrate method, Dr. London believes the direct method is more satisfactory in blood dyscrasias and infections. The number of reactions were decidedly less when the direct method was used. Transfusions were given by the direct method to patients with erysipelas, impetigo, typhoid, streptococcic septicemia, etc., without ever having these infections develop in the donors.

The route of administration may be either intravenous or intraperitoneal. The intravenous route is the one of choice. It places the blood directly into the circulation without delay and without any possibility of change. In infants, the jugular, superficial temporal and postauricular veins are commonly used. In cases of extremely ill infants whose veins are not easily approachable, it is better to cut down and expose the median basilic at the elbow or the long saphenous just anterior to the internal malleolus. The longitudinal sinus has been advocated, but this is a dangerous route except in most experienced hands. It has been claimed that the intraperitoneal route has all the advantages of intravenous transfusions except replacement of blood volume, that reactions are minimized and the procedure simple. Its chief advantage is the ease of administration. Its disadvantages are: Absorption from the peritoneal cavity is an uncertain process, and certain sick infants have an impaired capacity to absorb blood from the peritoneal cavity.

Indications for transfusion are: (1) hemorrhage; (2) shock; (3) diseases of the blood; (4) nutritional disturbances, and (5) infections and toxemias. Transfusions act as stimulants to the hematopoetic system. They are specific in hemorrhagic disease of the new-born infant; they check bleeding in purpura hemorrhagica and in persons with hemophilia, but do not cure these conditions. In pernicious anemia a transfusion will tide over a crisis and will frequently initiate a remission. In von Jaksch's anemia, Banti's disease and leukemias transfusion is only of temporary value. It is of great value in secondary anemia, not only in raising the red blood cell count and hemoglobin, but in preventing secondary infections to which anemic children are so susceptible.

In acute intestinal intoxication and athrepsia, transfusions are valuable adjuncts to the recognized treatment in conjunction with physiologic solution of sodium

chloride administered subcutaneously and 10 per cent dextrose solution given intravenously. It is useful in pyloric stenosis to decrease the operative risk and to lessen postoperative mortality. Transfusions present an increasing field of usefulness in cases of arthritis, acute hemorrhagic nephritis, nephrosis, pyelitis, extensive burns, carbon monoxide poisoning, dysentery, typhoid, bronchopneumonia, lobar pneumonia, empyema, endocarditis, erysipelas, lateral sinus phlebitis, mastoiditis, osteomyelitis, tuberculosis, etc. The patients with pneumonia who benefit most from transfusions are the toxic ones and those with a marked secondary anemia. In cases of acute hemorrhagic nephritis showing gross blood in the urine, the gross blood promptly disappears from the urine after transfusion. There are two possible explanations for this phenomenon: 1. Toxins that are damaging the glomeruli and causing bleeding are diluted. 2. The whole blood has a hemostatic effect. Infections for which there is a specific serum can be treated to better advantage when transfusions are given in conjunction with the serum. In all infections of a severe nature, the beneficial results of transfusion are probably due to the combating of the associated anemia plus the addition of immune bodies.

For cases of bacteremia, Dr. London recommends the use, as originated by Unger, of an autogenous immunized donor whose immunity to the infecting organism of the patient has been raised to a high level by the use of autogenous vaccine made from that organism. Several such cases were cited in detail showing clearly the advantage of this form of treatment with the amelioration of symptoms, drop in temperature and recovery.

PRESENT STATUS OF IMMUNIZATION AGAINST TUBERCULOSIS WITH B. C. G. (BACILLUS CALMETTE-GUÉRIN). DR. JOSEPH D. ARONSON.

Calmette believes that resistance to tuberculosis may be induced by impregnating the lymphatic system with a living strain of tubercle bacillus that is incapable of producing progressive tuberculosis in animals. This strain, designated as B. G. C. or the bacillus of Calmette and Guérin, was isolated from a cow in 1908, and has since been grown continuously on mediums containing beef bile. After thirteen years' cultivation on these mediums, the culture became avirulent. The majority of investigators are in accord with Calmette as to the avirulence of the B. C. G. strain, but several investigators have noted the occurrence of generalized tuberculosis in an occasional guinea-pig given injections of B. C. G.

By January, 1930, 210,000 infants had been vaccinated with B. C. G. in France alone. The vaccine is administered by mouth in three doses of 10 mg. each, at intervals of forty-eight hours. Vaccination must be completed by the time the infant has reached the age of 10 days, since the permeability of the intestinal mucosa is decreased after that age, Calmette believes.

Calmette states that the mortality from tuberculosis in infants vaccinated with B. C. G. has dropped from 15.9 to 3.4 per cent. Kereszturi and Park found in New York City among the vaccinated infants, that the mortality from tuberculosis fell from 8.6 to 1.1 per cent. Iakhnis found in Ukrania that the mortality from tuberculosis in the first year of life dropped from 16 per cent in the unvaccinated infants to 2.4 per cent in the vaccinated infants. Cantacuzene and his co-workers found in Roumania that the mortality from tuberculosis in the first year of life was 25 per cent among the unvaccinated and 2.3 per cent among the vaccinated infants.

Twenty-two babies have been vaccinated at the Henry Phipps Institute since December, 1927. Of these, 2 died of bronchopneumonia. An autopsy was performed on one infant, and no gross lesions of tuberculosis were found. Of the 22 vaccinated infants, 17 were tested intracutaneously with tuberculin: 14, or 82.3 per cent, reacted positively and 3 gave a negative reaction. Debre and Cofino found that 83.4 per cent of a series of 132 vaccinated infants reacted to the intracutaneous injection of tuberculin.

Book Reviews

KONSTITUTIONSTYPEN DER KINDER. By DR. W. S. KRASUSKY. Price, 4.20 marks. Pp. 62, with 6 tables. Berlin: S. Karger, 1930.

"Let me have men about me that are fat; Yon Cassius has a lean and hungry look; Such men are dangerous." Since Shakespeare wrote these words, many writers and laymen have used similar expressions in reference to the relationship between the constitution and the psyche. Biologists, eugenists, psychologists, psychiatrists, anthropologists and physicians have likewise thought about and investigated this subject for many years. Is there any scientific evidence that the observations of people in their daily lives are correct? Are the fat good natured and the lean ill natured?

In order that the reader may best understand the contents of this monograph he must first understand the meaning of the terms constitution, character and temperament and their functional relation with one another.

To quote Kretschmer, one of the best modern authorities on this subject, "constitution is the totality of all individual characteristics which are referable to heredity." He believes that constitution is inherited and hereditary, and includes all the functions of the body rather than any one or several functions. The term constitutional diathesis as used by the pediatrician is more limited in its meaning.

He describes character as the "totality of all affective and voluntary reactions" of any given individual reactions as they come out in the course of development. Character leaves out of consideration the bodily characteristics, while constitution embraces the whole organism. The former is influenced not only by heredity but by such exogenous factors as education; the latter precludes the environment.

In recent years, there has been a more scientific attempt to differentiate temperament from character. The most that can be said at the present time is that temperament is concerned with those psychic events which are responsive to chemical activity of an exogenous nature, such as drugs, and to that of an endogenous nature, such as the secretions of the endocrine glands.

The author has made a clinical medicopsychiatric study of constitution as it applies to childhood, using the Kretschmer classification. He has an interesting chapter on the history and evolution of constitution and personality from Hippocrates to Kretschmer, and he has presented a large amount of clinical material in the form of case reports (300 children from 4 to 8 years of age and 200 psychopathologic cases). He found no difference in the incidence of abnormal constitution between the sexes, although the asthenic type was somewhat more frequent among girls than among boys. In 54 per cent of all of his cases he was quite certain of the type of constitution; in the remaining 46 per cent the cases were too mixed to justify a definite diagnosis. Of the former, he classified 34 per cent as pyknic and 20 per cent as asthenic. In the period up to 8 years of age, 35 per cent were of the pyknic and 21 per cent of the asthenic type. Of the school age (from 8 years through adolescence), there were 28 and 29 per cent of the pyknic and of the asthenic type, respectively. Twenty-three per cent were a combination of both with the pyknic characteristics predominating, and 28 per cent were mixed with the asthenic characteristics predominating. Among the adolescents, he found that 40 per cent were of the asthenic and only 38 per cent of the pyknic type. The rest were mixed with the athletic and the dysplastic types, so closely resembling one another that the author could not separate them.

The chief value of this work is in the presentation of many interesting case reports. The attempt to correlate the physical characteristics with character and psychopathology is inadequate, because the only physical measurement used was the height.

To be of permanent clinical value a study of this kind must use the combined anthropometric, statistical and psychiatric methods. Analysis of case reports and an inventory of a single or several physical characteristics is insufficient. This subject delves so deeply into the depths of biology and psychophysiology that

it makes one fairly dizzy at even the thought of trying to make any permanent contributions to it in diagnosis and treatment.

PHYSICAL DIAGNOSIS. By RICHARD C. CABOT, M.D. Price, $5. Pp. 511. New York: William Wood & Company, 1930.

This is the tenth edition of a well known textbook on physical diagnosis. Many conditions representative of childhood are described, and much of the text is applicable to patients of that age group. Two hundred and seventy-five photographs, charts and tables are included to illustrate the methods of examination, depict pathologic conditions described and render more easy the interpretation of some parts of the text.

The material incorporated in the book is largely the result of the author's experience. He draws freely on the clinical and pathologic records of the Massachusetts General Hospital in support of his statements, although citing the results and opinions of others when the occasion warrants. He endeavors to confine his diagnoses within the limits of what he might reasonably expect to find at necropsy. For example, he refrains from diagnosing mitral regurgitation as an early lesion in rheumatic endocarditis, or emphysema as a necessary accompaniment of a "barrel-chest" because of his frequent failure to confirm these diagnoses at autopsy.

The general scheme of presentation of material is the same as in the preceding editions. After briefly taking up data relating to the body as a whole, the author proceeds in an orderly way to describe the observations that can be made in the different portions of the body in anatomic order, beginning with the head and the neck. As he takes up each section of the body he tells in detail the methods he has found most accurate and serviceable in making an examination. After he describes the observations that he considers as within the range of normal, he presents the modifications which may result from pathologic changes. He follows with the description of the observations of the various important diseases that may involve the structures under consideration, and a brief discussion of the differential diagnosis necessary.

Believing that there should be no great distinction between clinical diagnosis and laboratory diagnosis, the author combines all the methods of getting at an organ in a single section. He includes the ordinary laboratory procedures that are of value, most of which can be performed by the physician himself. He describes the technic of obtaining and examining the material, together with an interpretation of common observations.

In keeping with the relative importance of conditions of the chest in the actual practice of medicine, more than two fifths of the book is devoted to the observations in diseases of the heart and lungs. No structure of the body that can be readily examined is slighted. One chapter is devoted to the methods of examining the nervous system, and the more common changes that may be present.

The essential difference between this and the preceding edition of the book is the inclusion in the present volume of the observations on disease of the coronary vessels.

This is not only an excellent text for students, but is also of definite value to the practitioner as an aid in improving his methods of examination and interpretation of his observations.

TUBERCULOSIS AMONG CHILDREN. By J. ARTHUR MYERS, PH.D., M.D., F.A.C.P. With Chapters by C. A. STEWART, M.D., PH.D., and PAUL W. GIESSLER, M.D., and an Introduction by ALLEN K. KROUSE, M.D. Price, $3.50. Pp. 208, with illustrations and a colored plate. Springfield, Ill.: Charles C. Thomas, 1930.

"In the period of infancy and childhood lies the fountain head of tuberculosis" (preface). Not all cases of tuberculous disease in adult life originate during these early age periods, but the fact that childhood tuberculosis had prepared the way and left its mark in more than 50 per cent of clinical cases in young adults is a striking observation. Fortunately, during infancy and childhood tuberculous infec-

tion quickly registers its presence, and at this time the study of the development and progress of the disease is most productive of practical results. The author's service as physician-in-chief of the first special hospital for tuberculous children in the United States has provided him with much of the valuable material that he has incorporated in this small but comprehensive monograph. It is an eminently practical manual, and should prove of the greatest value to pediatricians, school physicians and especially to physicians engaged in family practice. The various diagnostic measures are fully and clearly described, especially those most valuable in childhood, viz., tuberculin skin tests and roentgen examination. The newer ideas concerning allergy and immunity in relation to tuberculosis are discussed, and the results of the latest clinical investigations are summarized. On every page the author has sought to correlate modern ideas concerning the etiology, pathogenesis and diagnosis of the disease with the ultimate problem of prevention. The manifestations of tuberculous infection and disease in infancy, childhood and the teen ages are well covered, including special chapters by C. A. Stewart and Paul W. Giessler on "Tuberculous Meningitis," "Tuberculosis of Bones and Joints" and "Chronic Non-Tuberculous Basal Pulmonary Disease in Childhood." An especially valuable chapter on "Some Dangers to Children from Tuberculosis Among Elderly People" rounds out the book. Each chapter is followed by an excellent summary, and by a sufficiently comprehensive, carefully chosen and up-to-the-minute bibliography.

STANDARDS FOR MATERNITY CARE. By the Children's Welfare Federation. Paper. Pp. 32. New York, 1930.

The report includes prenatal care, adequate delivery service, after-care qualifications and responsibilities of personnel; space, equipment and facilities, and suggested record forms.

Copies of the Standards may be secured from the Children's Welfare Federation, 244 Madison Avenue, New York.

A PRACTICAL MEDICAL DICTIONARY. By THOMAS L. STEDMAN, A.M., M.D. Price, $7.50, net. Pp. 1222, with 29 plates and many drawings and tables. New York: William Wood & Company, 1930.

This standard work has been thoroughly revised in the eleventh edition. The usual good binding and paper have been continued.

NOTICE

TRANSACTIONS OF THE SECOND INTERNATIONAL PEDIATRIC CONGRESS, HELD IN AUGUST, 1930

Just as this issue of the ARCHIVES was on the press, a notice was received regarding the procuring of copies of the *Transactions of the Second International Pediatric Congress* held in Stockholm in August, 1930.

The *Transactions* may be obtained by members of the Congress for 5 Swedish crowns, and by nonmembers for 10 Swedish crowns, plus postage.

Orders must be placed immediately as only a sufficient number of copies will be printed to fill the orders on hand. They should be addressed to Acta pediatrica, Artillerigatan 23, Stockholm, Sweden.

Directory of Pediatric Societies

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. C. A. Aldrich, 723 Elm St., Winnetka, Ill.
Secretary: Dr. Alfred A. Walker, Highland Plaza Apartments, Birmingham, Ala.
Place: Philadelphia. Time: June 8-12, 1931.

American Academy of Pediatrics

President: Dr. I. A. Abt, 104 S. Michigan Ave., Chicago.
Secretary: Dr. C. G. Grulee, 310 S. Michigan Ave., Chicago.

American Child Health Association

President: Hon. Herbert Hoover, 370 7th Ave., New York.
Secretary: Dr. Philip Van Ingen, 370 7th Ave., New York.

American Pediatric Society

President: Dr. Philip Van Ingen, 125 E. 71st St., New York.
Secretary-Treasurer. Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Edgewater Gulf Hotel, Edgewater Park, Miss. Time: April 15-17, 1931.

Association of American Teachers of the Diseases of Children

President: Jacob V. Greenebaum, 19 W. 8th St., Cincinnati.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Place: Philadelphia. Time: 1931.

Children's Hospital Association of America

President: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Secretary-Treasurer: Miss Bena M. Henderson, Milwaukee Children's Hospital, Milwaukee.

Canadian Society for the Study of Diseases of Children

President: Dr. E. A. Morgan, 160 Bloor St., Toronto, Ont.
Secretary-Treasurer: Dr. George E. Smith, 244 Bloor St., W., Toronto, Ont.

SECTIONAL

Central States Pediatric Society

President: Dr. Edward Clay Mitchell, 1073 Madison Ave., Memphis, Tenn.
Secretary: Dr. A. H. Parmelee, 310 S. Michigan Blvd., Chicago.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. H. Leslie Moore, 1717 Pacific Ave., Dallas, Texas.
Secretary: Dr. Ludo von Meysenbug, 3501 Prytania St., New Orleans, La.
Place: Louisville, Ky.: November, 1930.

STATE

Alabama Pediatric Society

President: Dr. Hughes Kennedy, Jr., Highland Plaza Apts., Birmingham.
Secretary-Treasurer: Dr. John W. Simpson, 1117 S. 22nd St., Birmingham.

Georgia Pediatric Society

President: Dr. W. N. Adkins, Medical Arts Bldg., Atlanta.
Secretary-Treasurer: Dr. E. N. Gleaton, 212 E. Gaston St., Savannah.

Louisiana State Pediatric Society

President: Dr. R. A. Strong, 1551 Canal St., New Orleans.
Secretary-Treasurer: Dr. Suzanne Schaeffer, Chailie Bldg., New Orleans.

Oklahoma State Pediatric Society

President: Dr. Carroll M. Pounders, 210 W. 10th St., Oklahoma City.
Secretary: Dr. C. E. Bradey, Medical Arts Bldg., Tulsa.
Place: Oklahoma City. Time: May, 1931.

South Carolina Pediatric Society

President: Dr. M. W. Beach, 126 Meeting St., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, The McLeod Infirmary, Florence.

Texas Pediatric Society

President: Dr. L. O. Godley, Medical Arts Bldg., Fort Worth.
Secretary-Treasurer: Dr. P. E. Luecke, 4105 Live Oak St., Dallas.

Virginia Pediatric Society

President: Dr. W. B. McIlwaine, Petersburg.
Secretary: Dr. J. B. Stone, 2042 Park Ave., Richmond.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. John Toomey, Cleveland City Hospital, Cleveland.
Secretary: Dr. A. B. Grossman, 7016 Euclid Ave., Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Secretary: Dr. Lawrence Murray, 1870 Bloor St., West, Toronto.
Time: November 17, December 15, February 16 and March 15.

Bronx Pediatric Society

President: Dr. David I. Frey, 2065 Grand Concourse, New York.
Secretary: Dr. H. M. Eisenoff, 1018 E. 163rd St., New York.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Second Wednesday of each month, except June, July, August and September.

Brooklyn Pediatric Society

President: Dr. Joseph F. Paulonis, 1357 Bushwick Ave., Brooklyn.
Secretary: Dr. Irwin Schiff, 658 Eastern Parkway, Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

Central New York Pediatric Club

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

Chicago Pediatric Society

President: Dr. Arthur H. Parmelee, 310 S. Michigan Blvd., Chicago.
Secretary: Dr. Bert I. Beverly, 8 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

Detroit Pediatric Society

President: Dr. Wyman C. C. Cole, 2970 W. Grand Blvd., Detroit.
Secretary: Dr. Charles A. Wilson, 71 E. Perry St., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Lee Bivings, Exchange Bldg., Atlanta.
Secretary: Dr. William Kiser, Medical Arts Bldg., Atlanta.
Place: Academy of Medicine, 32 Howard St. Time: Second Thursday of each month from October to April, 8 p. m.

Memphis Pediatric Society

President: Dr. G. J. Levy, 899 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. R. Graves, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. M. G. Peterman, 167 17th St., Milwaukee.
Secretary: Dr. F. R. Janney, 418 E. North Ave., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

Nebraska Pediatric Society

President: Dr. H. B. Hamilton, 434 Aquila Court Bldg., Omaha.
Secretary: Dr. George L. Clark, 1817 Vinton St., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive, 6 p. m.

New England Pediatric Society

President: Dr. Grover F. Powers, New Haven, Conn.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: October, January and March.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Hugh Chaplin, 39 E. 75th St., New York.
Secretary: Dr. John P. Caffey, Babies' Hospital, 167th Street and Broadway, New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

North Pacific Pediatric Society

President: Dr. Eber D. Kanaga, Townsend Bldg., Tacoma, Wash.
Secretary: Dr. Homer T. Clay, Washington Bldg., Tacoma, Wash.

Northern California Pediatric Society

President: Dr. Edward B. Shaw, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Lloyd Hardgrave, 384 Post St., San Francisco.
Place: Various teaching schools. Time: Monthly.

Northwestern Pediatric Society

President: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Secretary: Dr. F. G. Hedenstrom, 218 Lowry Bldg., St. Paul.
Place: University Campus and Rochester, Minn. Time: Winter, Spring, Summer, Fall.

Philadelphia Pediatric Society

President: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Secretary: Dr. John D. Donnelly, 115 Bryn Mawr Ave., Bala-Cynwyd, Pa.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. David H. Boyd, 200, 9th St., Pittsburgh.
Secretary: Dr. Theodore O. Elterich, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. Basil B. Jones, 2618 Grove Ave., Richmond, Va.
Secretary-Treasurer: Dr. John S. Weitzel, 3103 W. Franklin St., Richmond, Va.
Place: Westmoreland Club, 601 E. Grace St. Time: First Thursday of each month (other than during the summer).

Rochester Pediatric Society

President: Dr. John Aikman, 184 Alexander St., Rochester, N. Y.
Secretary: Dr. Howard F. Rowley, 176 S. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: First Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. Bernard C. Dorset, 1612 Tremont St., Denver.
Secretary-Treasurer: Dr. Wilford W. Barber, 227, 16th St., Denver.
Place: Children's Hospital, Denver. Time: Third Saturday of each month from September to May, inclusive, 2:30 p. m.

St. Louis Pediatric Society

President: Dr. Gustave Lippmann, 3720 Washington Blvd., St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, 3720 Washington Blvd., St. Louis.
Place: St. Louis Children's Hospital. Time: At least once a year and contingent thereafter on the arrangement of a suitable program.

Seattle Pediatric Society

President: Dr. Vernon W. Spickard, Cobb Bldg., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. William S. Bowers, 1136 W. 6th St., Los Angeles.
Secretary: Dr. Fred L. Glascock, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. W. D. Lyon, 101 S. Balch St., Akron, Ohio.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor, Mich. Time: November 14 and 15, 1930.